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ABSTRACT

Five papers presented at two inservice institutes for school speech and language pathologists delineated identification, remediation, and management of voice disorders in school children. Keynote remarks emphasized the intimate relationship between children's voices and their affective behavior and psychological needs, and thus, the importance of not separating a voice from its owner. As an example of a research aid derived for clinical diagnostic evaluation of voice disorders, the feature analyzer was described, which records cycle-by-cycle frequency and intensity changes in the speech wave. Dysphonia, resulting from vocal hyperfunction (yelling, shouting and speaking at an inappropriate pitch) was examined with respect to school voice screening programs, and therapy for children and adults. Questions were posed and answered relating to what a laryngeal physiology and pathology, assessments (medical, vocal, environmental), therapies, and management. Discussed as aspects of identification and management of voice disorders were the pattern of a normal voice, disorders caused by respiratory-phonatory imbalances, dysphonia, and such physiological problems as velo-pharyngeal incompetence caused by a palatal flaw. Interdisciplinary cooperation, clinician training, identification, management, and incidence of voice disorders in school children were incorporated in the discussion of the Jewish Hospital Voice Profile. (MC)

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Voice Disorders in School Children

CLINICAL MANAGEMENT

ED 078619

Program
on

VOICE DISORDERS IN SCHOOL CHILDREN: CLINICAL MANAGEMENT

Edited By
Frederick E. Garbee

EC 052 160

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Special Study Institutes Sponsored by the California State Department of Education, April 26-28, and, May 8-10, 1972, San Francisco and Los Angeles

EDITOR'S PREFACE

The public schools are one of the finest professional environments for the speech and language pathologist to provide services to children with communicative disorders. Two three-day programs on voice disorders as found in school children were presented on April 26 - 28, 1972 at the Sir Francis Drake Hotel in San Francisco and the Hilton in Los Angeles on May 8 - 10, 1972 to assist the speech and language pathologist in the schools to improve, update and enhance his or her expertise, skills, understanding and knowledge.

These in-service programs are in response to requests from school speech and hearing specialists from throughout California in search of up-to-date thinking on significant aspects of voice disorders in children. The programs emphasized how to evaluate and assess a voice disorder most efficiently and how to organize and carry out a therapeutic and rehabilitative and/or habilitative program for the child with a voice disorder.

More specifically the purpose of the institutes was to give major consideration to the identification and remediation of voice disorders in preschool and elementary children. The primary objectives of the programs were to identify theoretical and conceptual understandings of the nature of voice disorders in school children; to identify current therapeutic techniques and procedures for the management of children with voice disorders in the schools; and, to develop guidelines for effective programs in the schools for children with voice disorders.

Our in-service planning and programming for school speech and language pathologists are dedicated to the belief that public school speech and language pathologists are fully qualified professional workers with full privileges afforded any speech and language pathologist. Therefore, in planning this program and selecting instructors and personnel for the program I sought nationwide for the most experienced, sophisticated, stimulating and practical staff possible. Daniel R. Boone of Denver, William H. Perkins of Los Angeles, James C. Shanks of Indianapolis, and Frank B. Wilson of St. Louis each met these criteria and provided real substance and direction as instructors for the program. The manuscripts in this publication make this evident. Thought-provoking and added dimensions and perspective were contributed by keynote addresses and summaries of Fred D. Minifie of Seattle and Dorothy Molyneaux of San

Francisco. We are extremely fortunate in obtaining the participation of each of these professional colleagues.

Gordon L. Duck, Institute Coordinator, of San Francisco State College has made a major contribution to the success of the institutes. His superb job of communicating, coordinating of all efforts, and attending meticulously to all details necessary to a successful program are greatly appreciated. Allen G. Coltharp of the State Department of Education has been consistently supportive of these programs both as an administrator and as one of the two initiators of such a program from the beginning of the proposal.

Miss Sadie Kaye, Senior Administrative Assistant in the Office of Continuing Education in Health Sciences, University of California, San Francisco and staff made valuable contributions to the efficient arranging and presentation of the institutes.

Most recent reports from over 2,000 speech and hearing specialists in California's public schools indicate over 3,000 children in the schools in California are receiving services of the speech and hearing specialists because of their voice disorders. This publication and the special study institute programs are conscientious efforts to bring better services to these and other children with voice disorders.

Los Angeles
May, 1972

FREDERICK E. GARBEE
Consultant in Education of the Speech and Hearing Handicapped
California State Department of Education

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THE VOICES OF CHILDHOOD

By
Dorothy Molyneaux, Ph.D.
San Francisco State College

Several common interests bring us all here to this three-day conference on Voice Disorders in Children. First of all, we share an interest in the fascinating profession called Speech Pathology. We also share a desire for self-improvement which is no doubt a healthy professional sign. Just the other day, I read a definition that described education as the "process of moving from cocksure ignorance to thoughtful uncertainty." I assume that most, if not all, of us have arrived at that latter stage.

We are aware that there are many things still to learn in our field. We therefore take advantage of opportunities such as this conference to extend our knowledge and our therapeutic effectiveness. During these three days, Doctor Boone, Doctor Shanks, and Doctor Wilson will share with us much information on voice production, vocal assessment, and voice disorders and therapy. They have accumulated this wealth of information during years of experience in this particular area of our profession. Their common interest and their uncommon excellence in this area should be to our benefit.

All of us at this conference share another interest: children. Many of you work as school speech therapists; others of us work in clinic settings where we also see many children. In addition, many of us are parents, a role in which just occasionally, perhaps, we may find it difficult to maintain complete professional calm and objectivity. All of us have seen many children in a variety of circumstances and in a variety of linguistic and vocal environments. Our common goal is to assist the children with whom we come in contact to express themselves acceptably, efficiently, and effectively to others – in a voice which is also acceptable, efficient, and effective.

In thinking about these "keynote" remarks these past few weeks, and in trying to assign a title to them at the request of our persistent program coordinator, two possible titles came to mind. The first one was *Children – and their Voices.* I felt that such a title would convey a premise that has come to be more and more important to me as I have worked with young children, adolescents, and adults of all ages who manifest what we designate as voice disorders. The premise is that *it is well-nigh impossible to separate a voice* (for very long, at

least) *from its owner.* The voice-print of each of us is as unique as our finger-prints, we are told. It is unique because it is the manifestation of a number of characteristics – muscular, glandular, skeletal, and neurological – which together comprise our own particular organism – not to mention the myriad environmental influences, past and present, which have affected those characteristics.

Because it is so intimately bound in with our organism's activities, our voice is also a sensitive indicator of many of the dynamic processes which occur in us and which determine our behavior. Early in our education as speech pathologists we were taught that "speech is an overlaid function." That statement reminds us that the mechanisms which enable us to produce an airstream, with or without accompanying vocal tones, and which permit us to "fold, spindle, and mutilate" those tones or the directed airstream into the variety of phonemes we call "speech" are also involved in the processes which sustain life within us. Perhaps it was much later in our training program before we also learned how the cortical areas most involved in speech processes also send neuronal fiber tracts to the posterior portion of the thalamus for coordination and integration. The intimate connections of this sub-cortical area to the entire limbic system and to the pituitary gland account in part for the reflection of emotional states and physical stresses upon our voice and its characteristics. We can often tell if a person is angry or loving, frightened or confident, happy or sad just by hearing his voice, can't we? Even if we are too far away to make out the actual words a person is saying, we often deduce his general emotional state from his "tone of voice." Perhaps some of us have even experienced the stress described by Virgil in the *Aeneid:* "I was stupefied with fear; my hair stood on end and my voice stuck in my throat." Conversely, we all have probably had the experience of trying to "play down" or conceal an emotion we were feeling, only to find that our voice betrayed us.

Generalized bodily tension and general bodily stress reactions definitely affect the vocal mechanism and its performance. You will hear quite a bit the next few days about laryngeal hyperfunction and hypofunction and their characteristic effects upon tonal production and what we know as voice quality. You will be listening to many excellent tapes demonstrating disordered voices. You will be discussing techniques for modifying these conditions of hyper- and hypofunctioning of the vocal folds. Our speakers will probably discuss the effects of general body tension upon tension in the laryngeal mechanism. The speakers will discuss techniques that can be described as fairly "direct" voice therapy. I would just like us to remind ourselves that often voice therapy will be "indirect." Often reduction of bodily tensions and stress reactions in children must necessarily involve reduction of environmental and parental tensions and/or

pressures. Our plan of therapy may very well also involve helping the child to reevaluate and adjust in a new way to pressures and tensions he is facing in his everyday life. Sometimes, our voice therapy will be "direct" and will involve helping the child to understand how to care for his voice and motivating him to do so. But many times, voice therapy will be "indirect." If the voice we hear appears to be one manifestation of a general state of fearfulness, or timidity, or anxiety, or aggressiveness, or hostility – it will be worth our while to consider the possible causes of that general emotional state in this particular child's life space. A portion of our therapy might then be geared toward modifying those causal factors, either with or without additional professional as well as parental assistance.

Recently, I was talking to a speech therapist who was reminiscing about her college career. She told me how she almost failed her oral exam for the Master's degree. During the course of the exam, she first mentioned some therapeutic techniques which could be used for a "stuttering case." A little later on, she talked quite knowledgably about the "spastic dysphonia" she had observed in a hospital speech clinic. The exam appeared to be proceeding quite satisfactorily. But when, in the course of answering one of the questions her committee had asked, she mentioned the "cleft palate" she was working with in the college clinic, an elderly professor on her committee couldn't stand it any longer! He informed her in no uncertain terms that if she depersonalized one more client by referring to that flesh-and-blood human being as a speech disorder, he personally would see to it that she failed the exam! Needless to say, his remarks made quite an impression. Perhaps her experience conveys a bit of what I had in mind with the title *Children–and their Voices.*

We didn't use that title, though, after all. We couldn't figure out how to punctuate it. Perhaps it is a tribute to the infinite variety and subtlety of the human voice that it sometimes defies punctuation. What punctuation could automatically convey an emphasis upon the word *children* – a lingering on both syllables, accompanied by a subtle vocal inflection that somehow could indicate how precious we feel they are as complete, unique individuals – the next generation of the human race? What punctuation could convey the pause for thought, and then the grouping and timing of "and their voices" to indicate what we've been talking about: that vocal characteristics should be thought of as a sub-heading under the major heading called "children?"

So – we hit on the title *The Voices of Childhood.* For one thing, that doesn't need any punctuation. For another thing, it provides several jumping-off places for us to "get into the swim" of this three-day conference. Perhaps occasionally during these three days, we will

remember or be reminded of a voice from our own childhood. Perhaps we may ask ourselves how our voices sound to the children we speak to most. Children are notoriously sensitive to an adult's feelings of approval or disapproval conveyed through a tone of voice. Even a very young child who can't possibly be understanding all the words can start whimpering or crying when mommy or daddy speak in a sharper tone of voice than usual.

We should perhaps also remind ourselves that our voices often "live after us" – one way or another. I can remember my history teacher in junior high school. The most outstanding thing about her was her voice. (We'll probably hear several tapes in the next few days of people who came for voice therapy whose voices were really much more pleasant than hers.) When I think of her, I can still hear that monotonous, droning, high-pitched, hypernasal voice with the hyperfunctioning vocal folds. I don't remember a thing she taught us that semester. I just remember that at the time, I hated to go to that class because the teacher was so hard on the ears.

Perhaps our fond memories of happy times in childhood are tied in with the pleasant voices of people who were important to us gathered on happy occasions. Perhaps we remember when a soothing voice eased a hurt or upset. And perhaps, when we think about growing up, we recall how pleasant it was to hear someone other than our family whisper "sweet nothings" in our ear. Wasn't it Lord Byron who said: "Like music on the waters, is thy sweet voice to me"? Or perhaps you have pleasant memories of a person who fit Shakespeare's description: "Her voice was ever soft, gentle and low; an excellent thing in a woman."

I've mentioned a few of these voices from childhood to remind us that children are influenced and conditioned from infancy by the voices they hear. In infancy and childhood, certain people are important to the child and are instrumental in meeting his needs. No wonder that vocal characteristics of those significant people can arouse positive feelings in the child – so that later on in life he may feel especially comfortable with or drawn to people exhibiting the same type of voice he grew up liking. (Maybe that accounts for the fact that not all adults are attracted to the same types of voices: "One man's crow can be another man's nightingale.") As he begins to identify with certain significant people in his life, the child tends to identify with them and to model some of his behavior after theirs. He tends to take on some of their vocal characteristics also.

Sometimes, in our work as speech therapists we understand the etiology of a child's particular voice problem much better after we meet the "significant others" in his life. Have you ever had the experience of working to change a child's speech, voice, or language

patterns and then discovering that his parent had just about the same problem? That's not to say that change can't be effected in such an instance; just don't be surprised if motivation to change is less than you'd ordinarily hope for.

Experts on operant conditioning and behavior modification techniques have made us all very aware of the importance of reinforcement in the establishment of behavior patterns and personality characteristics from earliest infancy onward. This certainly holds true for the development of voice and speech patterns also. We all are aware that as adults we have within us the potentiality and capability for a wide variety of vocal behavior – a number of "different voices" as it were. Children also, perhaps even more than adults, are capable of a wide variety of vocal behavior. What vocal behavior will tend to occur most frequently depends to a large extent on which behavior gets most positive reinforcement – that is, meets one of the child's needs.

We could mention many examples of perpetuating and increasing particular vocal characteristics through positive reinforcement. The child who finds that his need is more likely to be met when he asks for something in a whining tone of voice, may use a whining tone of voice more and more often. If lots of laryngeal tension produces a voice that gets attention on the playground or more respect from the other children in the neighborhood, a tension-filled voice is what you're often going to get.

I worked for several years in what was called the "speech laboratory" at San Francisco State College. These were classes for students in the school of education who had been designated on a preliminary screening test as having voices or speech unsuitable for teacher-training candidates. Every so often, I would have in one of my groups a twenty-two or twenty-three year old woman with a voice that sounded more like a six- or seven-year old. Often, techniques such as those you'll be hearing about here at the conference worked beautifully in enabling the student to establish a voice quality which was more appropriate and effective for her adult roles. But occasionally, it appeared that a student was clinging tenaciously to the voice patterns that had brought her to the class in the first place. You won't always have clients who are as honest as one of these students was with me on the day she told me (in her childish voice which I won't attempt to imitate): "My boyfriend likes me better when I talk this way, and that's the only thing that matters to me right now."

Or have you ever come in contact with a child who had never had so much attention until he developed his voice symptom? In that case, more voice symptoms might well be forthcoming.

We'll remind ourselves often, then, in working with children – and their voices – that behavior we wish to establish as frequent and eventually habitual must be positively reinforced in some way. The behavior must prove useful to the child in meeting some of his needs. If we help him to experiment with ways in which to speak other than what he is used to, the new way of speaking must "pay off" in some way for him. Sometimes our job may be to help the child become aware of the rewards. Sometimes our job may be to help make room in a child's self-concept (or in the parent's concept of the child) for a new and different manner of speaking.

We see then that the voices of childhood are intimately associated with the emotions of childhood and the needs of childhood – which after all aren't really much different from the emotions and needs of adults. Modern psychologists (Abraham Maslow, for one) have reminded us that there are certain basic human needs – needs common to all of us regardless of age, sex, or racial origins. The lists of needs vary slightly from one group of psychologists to another; you can choose the list that most appeals to you. Maslow's hierarchy mentions the very basic biological needs such as food, air, water, elimination of wastes, and sexual activity; as well as warmth and shelter, love and affection, respect of others and self-respect; and self-actualization – or the realization of some of our particular talents and capabilities. Our emotional states are intimately connected with the satisfaction or frustration of these very basic human needs, and our voices can be important indicators of our emotional states. Behaviors (vocal and otherwise) which tend to occur frequently are those which somehow contribute to the satisfaction of some need.

During these three days, we will be learning a great deal about that aspect of human behavior called phonation. These few remarks have been a reminder not to separate the voice from its owner – for very long.

EVALUATING VOICE DISORDERS: A POINT OF VIEW

By
Fred D. Minifie, Ph.D.
University of Washington

My presence at this conference stems from some comments I made at an open meeting of the American Speech and Hearing Association at the annual meeting in Chicago last November. There I expressed concern over the future of our profession of Speech Pathology and Audiology. I was concerned then, as I still am, about the growing feeling of disenfranchisement among many of the so-called "researchers" within our organization. I am concerned about the apparent cleavage between clinical and research interests. The major thesis of that talk was that there is much that the clinician and the laboratory researcher can do for each other if only we can communicate.

Now most thinking speech pathologists recognize that the future of our professional discipline is dependent upon the quality of the questions we ask about our patients, about our clinical endeavors, about our diagnostic and therapeutic tools, etc. Since our professional growth hinges on the kinds of research we do – in whatever setting that research is done, be it clinic room, laboratory or classroom – we must address ourselves to this most important question of "How can we as clinicians and researchers work hand-in-hand to improve the efficiency and effectiveness of our therapy?" Not only will the answer to that question build an important psychological bridge, but will also build a foundation for our professional future.

My remarks in Chicago evidently struck a consonant tone in Fred Garbee, for when plans were being made for this excellent conference, he asked me to come and share some of my thoughts with you. (Maybe I'm being overly naive. Perhaps he was saying, come on down and put your money where your mouth is.)

Wendell Johnson once told me that when you give a talk what you want to do is to think about your topic, spend your preparation time trying to get into a proper mood for the topic, and then stand up and just "let your nervous system jangle." Now because of the nature of this conference, I didn't want to follow this advice and step up without notes and speak from the heart. My heart tends to be a little less organized than my notes, if that is possible. But I can tell you what

my mood is. My mood is contemplative I come here as a person who doesn't know very much about voice disorders. Oh, I once thought I knew, but I think I lied to myself. I am trainable. I approach this conference eagerly for I think that before the next three days are over, we will have all learned a great deal about voice.

Perhaps there is an additional orientation that would be useful to you as we embark on this conference. I was once given advice as I was preparing to go away to college from a teacher, who was convinced that as a group my classmates and I would never make it in college. He said when you go away to college you will find that you have a lot of reading to do and very little time to do it. A professor will expect you to read a hundred pages overnight. So he gave us some advice about reading lead sentences in paragraphs, lead paragraphs in major sections of a book and so on, but he did it his way – by analogy. He described a situation in a barnyard where a farmer had a trailerload of manure he was unloading onto the ground. A young boy was watching this process and was amazed when the farmer picked out of his pocket a handful of dimes and threw them into the manure pile. He finished dumping the load on the ground and posed to the boy that he could keep the dimes if he could get them out of the manure. The problem was how do you get them out. You can sort through it bit by bit, or you can take a pitchfork, shake it and pick out a dime every time you see one flash. The boy's problem is much like the one we face as we embark on this conference. Embedded throughout this conference will be some real dimes. How are you going to get what you want out of this meeting. Your strategies may be somewhat individual since we recognize that "one man's dime is another man's . . . . . ".

To me, voice disorders have been among the most perplexing problems with which we as speech pathologists have had to deal. Partially they are perplexing because we find it difficult to define voice disorders in realistic terms. We tend to use such vague terms as "harsh, hoarse, rough, too weak, too loud, breathy, too high, too low," etc. These terms are not meant to be descriptions of the physical acoustic waves generated by talkers, but rather terms which are related to the perceptual reality of the various voice disorders. Our ability to communicate effectively from one professional person to another when using such terms is dependent upon shared perceptual references. Now I don't know how you respond to those terms, but to me, I am quite uneasy when I use them, for although I think my listener knows what I said, I am not sure that he understands what I mean. If this is a problem when talking with another professional, it is even more acute when talking with a patient.

You may argue that one of the reasons that we use perceptual

terms is that the physiological and acoustical descriptions of voice disorders have been confusing and nondiscriminatory. And that is true. It is perhaps also true that we have used the wrong kinds of physiological and acoustical descriptions. Typically, and regrettably, we measure what we are capable of measuring and not necessarily what we should be measuring. If we ask different questions of ourselves, perhaps we can gain fresh insight to voice disorders. My purpose in this presentation is to explore the kinds of things the clinician can teach the researcher about theories of voice production, and the kinds of things the laboratory researcher can teach the clinician about clinical diagnosis.

Perhaps one of the first things we learn in a beginning voice class is that normal phonation is the result of interaction between the respiratory mechanism, the laryngeal mechanism, and the mechanisms of supraglottal articulation. We learn that voice disorders can result from inappropriate usage of, or physiological impairment of, any of these mechanisms.

Early in my professional training I was influenced by the work of Jim Hardy and some of his colleagues who were exploring the role of the respiratory mechanism in speech production. You may recall that he suggested that there are three important factors related to respiration for speech purposes: air supply, air support, and air usage. Hardy developed his thinking after working with a number of cerebral palsied children and children with other neurological impairments at the Iowa City Hospital School for Handicapped Children. He could identify children with impaired respiratory mechanisms who could only breath very shallowly. He argued that their weak voices and short utterances were partially the result of inadequate air supply. He also argued that an important control of air escape during connected speech was the checking force exerted upon the rib cage by the inspiratory muscles. And indeed, he had pretty good evidence to support his contention. Finally, he argued that disarthric children, who can not valve the air stream as rapidly as you or I, have an inefficient usage of the air available to them. I am probably misleading you if I let you assume that the substance of the foregoing summary adequately represented Hardy's thinking then or now. The major point I wish to make is that my thinking about the role of the respiratory mechanism during speech was markedly influenced by his work. I could see how the various systems interacted to control speech and voice. I thought I understood how the systems worked together.

Then one day, Dr. Arthur Siebens of the Department of Rehabilitation Medicine at the University of Wisconsin, with whom Dr. Thomas Hixon and I were doing some collaborative work on res-

piratory mechanics during speech, had some patients he wanted us to see. He described these patients as automobile accident cases who had complete severage of the spinal cord at about C_6. He described them as having no muscular innervation to the limbs and torso aside from the innervation of the vagus nerve. That meant that the respiratory mechanism now was reduced to the action of the diaphram, since the thoracic and abdominal muscles were neurally dead. Hixon and I jotted down all of the things we would expect to see in such a patient: good articulation skills (primarily a voice problem), weak voice, little control over pitch or intensity, inability to sustain long utterances, etc. As you might by now assume, the first patient we saw spoke as normally as you and I. He did have some difficulty in precipitous shouting. We were frankly amazed by the patient for he didn't fit our theory. According to the physician's report, the patient sounded much the same as when he was hauled into the hospital on a stretcher. Observing that patient caused me to change much of my thinking about the role of the respiratory system in the regulation of voice. I now place a great deal more attention on the laryngeal mechanism and not so much on the interaction between the laryngeal and respiratory mechanisms when describing mechansims for changing fundamental frequency and intensity. Since that patient was only able to exchange about 500 cc of air total – his new functional vital capacity – this meant that he was normally changing his fundamental frequency and his intensity within a very limited range of subglottal pressures, as compared to the normal talker. I think I understand voice disorders a little better because I saw that patient. Although normal talkers have the capability of deep inspiration, we rarely need to exceed the limits of our tidal breathing for speech purposes. Primarily what we do is regulate the laryngeal mechanics and the dimensions of the supraglottal resonance system to change our pitch and intensity contours. The basic driving force for voice production (transglottal pressure drop) is determined largely by the respiratory system. We have a considerable control over the sound intensity at the mouth opening by changing the area of mouth opening. In an effort to follow up on the earlier observations with the spinal cord lesion patients and some other work Hixon was doing, he and I put some subjects in a whole body plethysmograph where we could impose variations ir air pressure across their body wall and essentially take the control of the transglottal pressure drop away from the subject. We asked the subject to phonate at a given intensity. He would watch a sound level meter until he could sustain the sound at a given level. His control over intensity was partly achieved by changing the subglottal pressure, although in large measure was dependent upon the size of his mouth opening. We then varied

sinusoidally the transglottal pressure drop and measured the changes in the intensity of the sounds at the mouth opening. We found that no matter what the average sound pressure level was, the changes in intensity related to changes in the transglottal pressure were essentially constant. This leads us to believe that changing the average intensity of the voice or changes in intensity from word to word can be achieved by changes in area of mouth opening, and that slight variations in level can be imposed by respiratory or phonatory adjustments.

At the University of Washington we have been interested in providing a means for assessing the kinds of dynamic changes in a fundamental frequency or intensity that occur during connected speech. We have been unconvinced that the measures of average fundamental frequency or intensity, or even the variability of these parameters as indicated by standard deviation values, tell us much about the patients we deal with. Rather, we would like to be able to provide an indication of the instantaneous cycle-by-cycle changes in the vocal output. So we talked to our electronics specialist and told him we would like to have a feature analyzer built which could provide a record of changes in fundamental frequency and intensity from cycle-to-cycle in the speech wave. I have taken some pictures of the output of the feature analyzer which I would like to share with you, for they indicate to me the kinds of information which we as speech researchers ought to be able to provide to speech clinicians in helping with the diagnosis or evaluation of voice disorders. I must apologize for the darkness of the slides – perhaps those of you who are amateur photographers will bear with me.

The first slide shows the output of the feature analyzer for a normal talker saying that old classic sentence, "Joe took father's show bench out." Notice the change in the fundamental frequency contour. F_o increases as we go "up" on the slide. Essentially what you see is a melodygram, plotting the cycle-by-cycle changes in fundamental frequency. We also see dynamic changes in the sound pressure level trace. Slide two shows essentially the same thing as slide one, only now the talker is saying, "He left it lying on the lawn," using a falling inflection at the end of the utterance. Most of you are probably aware that many of the attributes of the aging voice or of some of the voice disorders are not related to what goes on in the middle of the phonations, but by what is happening to the voice at phonatory boundaries. This kind of a dynamic presentation of the changes in fundamental frequency and intensity allows us to monitor those changes and provide a graphic record of them. The next few slides show an array of special types of phonation for

demonstration purposes:
Slide three: Vibrato
Slide four: Tremelo – just like vibrato only with more quiver.
Slide five: Infant cry
Slide six: Infant cry – notice that the voice becomes breathy and irregular at the end of the cry.
Slide seven: This slide shows a series of records which we obtained from a 35-year-old male talker with habitual use of falsetto voice. The record follows his progress in therapy. Notice in the first example he is using a very high fundamental frequency and has sharp downward inflections at the beginning of each word or phrase. He tends to use a rather stereotyped and repetitious vocal style. As he progresses in therapy, the pitch tends to lower and his inflectional pattern tends to become more normalized. I would like to play a tape that has five samples of his vocal pattern at different stages in therapy. Sample two was taken only thirty minutes after he was first seen in the speech clinic. Sample two is not shown on the slide since the patient misread the sentence.

If we did not have a display of the changes in fundamental frequency on this patient, we could not have identified as precisely as we can what his vocal problem was. It is our intention to have the therapist use the instantaneous records from this feature analyzer to provide immediate feedback to the patient as to whether the patient can perform or carry out the specific recommendations of the therapist. This device, therefore, becomes an instrumental aid to the therapist in clinical diagnosis or in evaluation of progress in therapy. The cost of such a device is reasonably low, so as to make it available to most clinics.

Consider what the display would look like if a harsh speaker were going through the pitch perturbations or amplitude perturbations described by Yanigahara and von Leden. The cycle-by-cycle variations in frequency or intensity may be observed and used by the therapist and patient in modifying future vocalizations. Here is an example of how the scientist can help the clinician obtain the information he needs.

I don't know if I have accomplished the mission that I set out on this morning. I want you to see a little of the vision that I see about the benefits to be gained from a marriage of clinical and research interests. We needn't be hesitant in seeking each other out for there is much to be gained from our interactions. Perhaps as we embark on this conference we can approach the next few days with an eager excitement about what can be learned about diagnosis and evaluation of voice problems. We have, aside from the present participant,

as fine a group of experts on voice disorders as we could hope to put together. I will be most interested in listening to their presentations in an effort to add to my own understanding of voice and voice disorders. My summarial comments at the end of this conference will be directed toward integrating the material presented. Usually a conference of this sort also raises a lot of questions. It will be interesting to see if the cerebral itches that I get as a nonclinician from the presentations will parallel yours. My mood remains contemplative. I still don't know very much. I believe I am still trainable, so teach me.

VOICE THERAPY IN CHILDREN

By
Daniel R. Boone, Ph.D.
University of Denver

Most voice disorders in children are caused by continued abuse and misuse of the voice. The children continue vocal hyperfunction (yelling, speaking and shouting too loudly and at inappropriate pitch levels) day after day. As a result of this continuous abuse/misuse, these children may develop dysphonia. In addition to the dysphonia, prolonged vocal hyperfunction may produce vocal fold thickening, vocal nodules, and vocal polyps. The vocal management of children who abuse their voices will be the focus of this paper.

Identification of children with dysphonia. Occasional children who demonstrate continued dysphonia are examined by the child's physician and frequently referred for indirect laryngoscopy by an otorhinolaryngologist. Most dysphonic children, however, continue with their "hoarseness, breathiness, harshness" for indefinite periods of time with their parents and teachers incorrectly assuming that "this is the way he talks." Such dysphonic school children should be identified by the speech pathologist in the school and referred for a medical laryngeal evaluation. Persistent dysphonia in a child may well be a presenting voice symptom of a serious laryngeal disease, such as papilloma, and is certainly deserving of a thorough medical examination. A conservative rule for the speech pathologist to follow would be to refer any child (or adult, for that matter) who is dysphonic for more than seven days for a medical diagnostic evaluation of the larynx.

It appears then that the school speech pathologist sees two kinds of dysphonic children: first, he sees those few children who are referred to him, such as by an otorhinolaryngologist and secondly, he discovers children in his school speech screening program who need laryngoscopy and possible medical treatment for their dysphonias and/or voice therapy. The first kind of problem, the child who is referred to the speech pathologist by the otorhinolaryngologist, usually receives a voice therapy regimen which focuses on identification of vocal abuse/misuse with subsequent voice therapy attempts initiated to reducing this identified abuse/misuse. The great need in most school speech and hearing programs, however, is the initiation of voice screening programs designed to discover the

child with a persistent dysphonia (more than seven days) who will then require both laryngoscopy by the physician and possible voice therapy by the speech clinician.

School voice screening programs. Most speech and hearing clinicians in the schools initiate speech screening programs for specified classes at fixed time intervals; for example, many school clinicians do screening in the schools in the Fall before beginning their daily therapy schedules. It would appear that a small voice screening program could be added to the present speech and language screening measures which are employed to screen "normal" school children. A simple screening form may be added to existing screening evaluations with very little additional testing time required per child. Here is an example of a screening form which could be used for the identification of children with dysphonia, all of whom would be followed with a more thorough diagnositic voice evaluation.

Voice Screening

Pitch	Adequate 1 2 3 4 5 6 7 8 9 Poor
Phonation Quality	1 2 3 4 5 6 7 8 9
Loudness	1 2 3 4 5 6 7 8 9
Resonance Quality	1 2 3 4 5 6 7 8 9

These four variables would each be rated using a nine point rating scale. Pitch would be evaluated relative to the child's fundamental frequency appropriateness for his age and sex; a voice pitch compatible with age and sex would be rated a "1" and a pitch level that is obviously incompatible with "where it ought to be" would be rated a "9". With the advent of puberty there is considerable lowering of fundamental frequency. By the time a boy has completed his pubertal growth, his pitch level has dropped about one full octave from prepubescent levels (C_3 down from C_4) while post-pubescent girls have also experienced a lowering of pitch of three or four musical steps (G_3 from C_4). Since pitch levels change dramatically during pubertal changes, it is perhaps not too realistic for the school speech and hearing clinician to make pitch determinations as stable indices of the pubertal child's actual pitch usage; for example, a optimum pitch value obtained in September of a 14-year-old boy may be wholly obsolete for that same boy by December of the same year. Primary level children frequently demonstrate pitch levels which are incompatible with their age and sex. Typical findings would be that boys sometimes demonstrate pitch levels that are too low and girls use pitch levels which are too high. Post-mutational pitch disorders are generally found among boys who demonstrate inappropriately high voices, sometimes using falsetto, long after pubertal changes have been completed.

Phonation quality is rated specific to the presence or absence of hoarseness, harshness, breathiness. Normal quality is rated at the "1" end of the scale with severe quality disorders rated on the "9" end of the scale. Any departure from normal in phonation quality should be noted. A phonation disorder is produced by inappropriate approximation of the vocal folds, with the folds either too laxly adducted or too tightly approximated. This approximation inadequacy might be further categorized using Wilson's (5) rating system of −3 for complete lack of approximation (as heard in aphonia) to the other polar extreme of +3 where the folds tightly and excessively approximate (as heard in spastic dysphonia); and deviation from normal is plotted along this rating continuum: −3 −2 −1 0 +1+2+3. For whatever phonation departure the clinician detects in his screening, he might wish to make a word or two notation along with his numerical judgments.

All loudness judgments must be made within the context of the screening evaluation. Therefore, the clinician must remember that the artificial situation imposed by the testing environment might well reduce loudness levels in any child who is somewhat frightened by the screening procedure. Nevertheless, as the child repeats the verbal tasks of the speech and language screening, the clinician should rate the child's loudness adequacy on the one to nine scale with "1" ratings depicting normal loudness for the situation and a "9" rating given for too soft or too strong loudness. Perhaps in followup observation and evaluation of children who present loudness problems during screening, the clinician will find loudness inadequacy not to be a problem.

Any nasal resonance deviation is also noted during the brief voice screening. No distinction is made during the screening on whether the child demonstrates hypernasality, denasality, or assimilative nasality, unless the clinician wishes to make a verbal note on the screening form. Normal nasal resonance is marked on the "1" end of the scale and marked resonance departures would be rated at the "9" end. Those children identified as possibly having a resonance problem would return at a later time for a diagnostic evaluation.

The speech and hearing clinician who employs a voice screening scale as part of his school speech and hearing screening should remember that such a scale helps him systematize his observations about the child. By using such a device he will be sure to apply some observation relative to pitch, phonation quality, loudness, and resonance quality for each child. Criteria for followup selection will vary according to the clinician's standards, case load demands, scheduling flexibility, etc. Perhaps any child who obtains a "5" or "6" rating for any one of the four parameters would be recalled for

more thorough observation and testing. Perhaps attempts should be made by the clinician to observe any child with a problem rating in the classroom or on the playground so that further observations may be made relative to the consistency of the problem. If upon further observation, the voice departure is still observed, the child should then be scheduled for diagnostic testing. If further testing found the child to present a voice problem, he would then be referred for medical evaluation prior to the initiation of any voice therapy program.

Hyperfunctional voice disorders. Misuse and abuse of the voice will produce many varied forms of dysphonia. The child may demonstrate a loss of voice after prolonged use (misuse or normal), he may demonstrate a hoarseness or breathiness, his pitch level might lower after abuse, or he might become aphonic, losing his voice entirely. The result of this prolonged vocal abuse on the vocal folds might well lead to swelling, redness, and edema; vocal folds which have been doing a lot of yelling, for example, usually show the increased redness and irritation which the yelling has caused. In many cases, decreasing or desisting the irritating vocal abuse will be all the folds require to return to their normal "pearly white" state. Some children who continue their vocal abuses over time eventually develop vocal fold thickening, sometimes leading to vocal nodules and sometimes to vocal polyps. Early nodule and polyp formation, when discovered early in their development, can usually be eliminated by voice therapy. Nodules that are large and hard, similar to large polyps, may well require surgical removal followed by voice rest and then by voice therapy. Some children referred to the laryngologist are found to have medical problems, such as laryngeal web or papilloma, disorders which require close medical supervision and are not the result of vocal hyperfunction. The majority of voice problems in children, however, are highly responsive to voice therapy.

While distinction must be made by the laryngologist between functional voice disorders and organic changes of the vocal mechanism, this dichotomous grouping aids only in ruling out pathology. From a voice therapy point of view, there is little difference in the approach between functional and organic voice problems. That is, the dysphonia of someone who has nodules, polyps, contact ulcers, cord thickening is not approached differentially from the person who has dysphonia because he over or under adducts his vocal folds. A hyperfunctional voice disorder, regardless of whether or not there have been tissue changes, is the result of too much muscular force or inappropriate force in the wrong places. After identification and elimination of these forceful vocal abuses, the child experiences a

better voice. The elimination of excessive force in respiration, phonation, and resonance will reduce most of his voice problem. There are occasional cases of voice disturbance in which the disorder serves the child and is only a symptom of an underlying neurosis. The reduction of hyperfunctional vocal behavior results in a concomitant reduction of vocal symptoms, regardless of the psychological needs of the person. Voice therapy for years has been frequently avoided by the laryngologist or pathologist because of a prevailing misbelief that most voice problems are merely symptoms of deep and unresolved psychological problems. The clinical evidence seems to say, "We can take the problem out of your voice and you will still have your tensions and personality problems – but your voice will sound like ours." The modification of the voice problem by direct symptomatic voice therapy is possible for most hyperfunctional voice problems after their identification.

A typical hyperfunctional site might be in the area of respiration. Phonation is dependent upon an adequate outgoing air stream which produces a sufficient subglottal air pressure to trip the approximated vocal folds into vibration. It appears that the demands of everyday phonation, as well as the added phonatory requirements of the actor, lecturer, or singer require that we develop a sufficiently controlled quantity of air, sustained in a prolonged exhalation. Some patients with hyperfunctional voice problems work much too hard to breathe. Actually, there is no great need for an exceptional vital capacity to be a good speaker. What one needs to develop is control of his expiration. The optimum inhalation for speaking and singing appears to be an only slightly enlarged tidal breath, perhaps like the inhalation required for a sigh of "well being". Shoulder elevation, and other signs of attempting to take a large breath, result only in an excessive outflow of air which in no way produces better phonation.

There are specific hyperfunctional behaviors at the site of the larynx. One of the most damaging vocal behaviors is the hard glottal attack, described by Jackson and Jackson (4) as the slamming approximation of the vocal processes of the arytenoid cartilages often causing contact ulcers. The formation of other laryngeal pathology, such as cord thickening, nodules, and polyps is often the result of excessive force in vocal cord approximation, as well described by Arnold (1). Many people who have dysphonia but no structural change of the laryngeal mechanism overadduct the vocal folds. This limits the free vibration of the folds and produces a harsh voice or perhaps the laryngeal "stutter" of spastic dysphonia. Most clinical voice problems, with or without structural deviation, are characterized by problems of faulty vocal fold approximation. The patient usually

is between the extremes of spastic dysphonia and functional aphonia. Inappropriate pitch level frequently contributes to laryngeal hyperfunction. Children may speak either at the bottom of their pitch range or too high. An inappropriate pitch level, whether it be too low or too high, requires unnecessary muscle efforts to maintain the needed vocal adjustments of length and mass to produce the artificial voice pitch. Sometimes just by raising or lowering the fundamental frequency slightly, the child will experience a noticeable decrease in dysphonia. One of the greatest of all causes of vocal dysfunction is vocal abuse, such as excessive laughing, crying, yelling, or screaming. Coughing and excessive throat clearing frequently contribute to the problem of dysphonia and laryngeal pathology, perhaps adding edema and irritation to other pathology. Once a vocal abuse has been identified, intelligent efforts to reduce such behavior may well result in a lessening of the vocal distress.

In the supraglottal areas, the hypopharynx is a common site of hyperfunction. Contracted pharyngeal constrictors and the tongue posteriorly retracted fill the hypopharyngeal opening. This produces an acoustical problem resulting in a restriction of oral resonance and produces "cul de sac" resonance. Although hyperfunctional carriage of the tongue, either too far back or too far forward, may create many acoustical variations of the voice, it is often not recognized as a contributing cause of an existing dysphonia. Another disorder of resonance may be the hyperfunctional use of the soft palate with the velum kept in a fixed or open position. This lack of palatal movement is sometimes directed volitionally by the patient as he attempts to create a "God-like" voice or imitates nasal speech, or attempts to sing like an "Irish" tenor. Prolonged attempts at artificial resonance may create unnecessary constriction and tensions. Eliminating such hyperfunctional behaviors may reduce overall vocal hyperfunction. One of the most commonly observed hyperfunctional behaviors is speaking with mandibular tension, or talking through one's teeth. Here the child makes most of the muscle adjustments required for continuous speech almost wholly with his tongue with the mandible locked in a passive role. This means that for the various adjustments required for producing vowels the patient changes the size of his oral cavity by flattening or elevating the tongue with no size change contributed by opening of the mandible. The majority of voice patients of all ages with various forms of dysphonia complain of symptoms of vocal fatigue, pain, or fullness in the hyoid area after prolonged speaking or singing. Mandibular restriction is a commonly observed entity in many patients, an observation which was recognized by Froeschels (3), and which resulted in a subsequent development of his chewing approach in voice therapy. Anything the patient can do

to develop a more generalized oral openness usually has a noticeable effect on the sound of his voice.

Voice disorders often begin as a natural sequence of true organic disease. Some children's voice problems seem to have their origin from acute local disease of the respiratory tract, including the larynx and pharynx. The acute problem may force the individual to produce his voice with a surplus of effort, producing hyperfunctional voice behaviors which may well persist after the acute infection is over: or, the child may suffer from allergies which force him to use his vocal apparatus in a strained way. The vocal trauma of a particular event, such as yelling, may produce temporary laryngeal changes which cause compensatory vocal behaviors which persist and become the individual's "set" of subsequent vocal behavior. Singing under exceptional conditions (inappropriate pitch range, too loud, too long) may produce temporary phonation changes, requiring the individual to attempt varied effects to overcome a temporary dysphonia. Such vocal compensation may become a permanent part of his vocal repertoire.

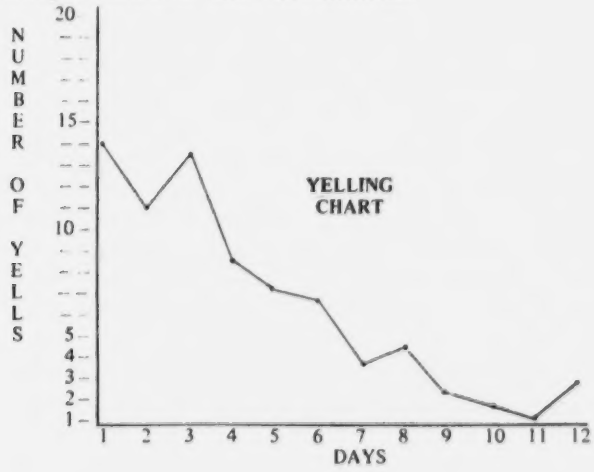
Voice therapy for children. It is almost impossible to successfully do voice therapy with pre-school children, although the symptoms of dysphonia require the attention of the physician to rule out such conditions as papilloma or webbing. However, it is most difficult for the voice clinician to conduct any kind of remedial voice therapy on any kind of formal basis. The clinician's focus would have to be in his attempt at isolating particular vocal behaviors which may be abusive to the child's vocal mechanism, i.e., identifying an excessive amount of yelling. Efforts are then made in counseling both the parents and the child relative to the need to curb his vocal abuse. Clinicians occasionally have success with this pre-school counseling with the child experiencing a concomitant improvement in his voice. There are also many failures in our counseling attempts at this early age level, and there are many clinicians who prefer to wait until the child is older, at least, until school age for such counseling to begin. If we have any success at this early level, it is in our occasional success in identifying the child's vocal abuse and then with our subsequent counseling having the effect of reducing that vocal abuse.

The school aged child, six through twelve years, can frequently be helped by voice therapy. The speech and hearing clinician in the schools probably encounters more children with hyperfunctional voice problems than any other voice specialist. Cord thickening and vocal nodules are the most frequently found laryngeal pathologies which produce dysphonia. Many children, however, exhibit severe dysphonia, especially boys ages ten through thirteen, for purely

functional reasons and upon indirect laryngoscopy are found to have no laryngeal pathology.

The most effective therapy for school aged children is for the clinician to isolate for the child those situations in which he is vocally abusive, such as yelling at a ballgame, screaming on the playground, crying, imitating voices much below or above his natural pitch range, etc. Many children maintain their vocal pathologies simply by engaging in abusive vocal behavior for just a brief period each day. The old adage, "a little vocal abuse each day will keep a voice problem alive" (2) is particularly relevant to the voice problems of children. It is usually not possible to identify these vocal abuses through interview methods or by observing the child in the therapy room; rather, the child must be observed in various play settings or in the classroom. This need for extensive observation requires that the clinician solicit the help of the child himself to determine where he might be yelling or screaming. The teacher may provide some helpful clues about the child's vocal behavior on the playground and in the classroom. Parents can often reveal further environmental situations where the child is heard to abuse his voice. Parents may be asked over time to listen for abusive vocal behavior by the child in various family settings. At times, we can utilize the child's siblings or peers to help us in determining what the child may be doing vocally in certain situations.

Once abusive voice behaviors have been identified and isolated, the clinician must obtain baseline measurements of the number of times the vocal abuse is observed in a particular time unit (an hour, a recess period, a day, etc.) Here is a "yelling chart" that a ten year old boy recently returned to this voice clinician:



We can quickly see that over a 12 day period there was a marked decrement in the child's yelling (at least, as counted by the child himself.) On the first day a baseline of 14 yells was observed; by the end of the week, he found himself only yelling three times. Such developing self-awareness of the vocal abuse, as required by keeping a tally count of what one is doing, has proved itself to be an excellent way of extinguishing an aversive vocal behavior. While some children require some assistance in maintaining such a tally count by the teacher, a parent, or a friend, it appears that most children can do this task very well by themselves. It has been written elsewhere by this writer:

> "It appears that if the child is given a proper orientation to the task and clearly knows why he must cut down his number of vocal abuses, his tally counts are higher, and perhaps more valid, than the counts of the external observers."
> (2, p. 106).

All voice therapy with children must be preceded by a proper explanation to the child of what his voice problem is and what can be done for the problem in voice therapy. For example, it is a rare child who feels that he has a voice problem. An explanation about the voice problem is most important for the majority of voice cases we might see in a school setting because these children are not self-referred. That is, we usually find them and each child may well be convinced that he has no problem. Therefore, the clinician who uncovers a voice problem has a selling job to do, not only to the child himself, but often to his parents, his teacher, the school nurse, and often to the speech and hearing supervisor.

Effective voice therapy does not lend itself well to group therapy. Therefore, the speech and hearing clinician whose large case load forces him to work in groups may not be able to work effectively with the child with a voice problem. Since the child's own best voice production is often his primary target therapy goal, grouping of children (each with a different target model) could be very confusing. While different articulation disorders and the children who have them can often be grouped effectively, this lack of homogeneity works against treatment effectiveness in voice therapy. If at all possible, children with voice disorders profit from individual speech therapy on a twice weekly basis, with each session 20 to 30 minutes long.

Children going through puberty are not good candidates for voice therapy. Their vocal mechanisms at this age are changing so rapidly, with all cartilage and muscles of the larynx increasing in growth so dramatically. For example, the length and thickness of the vocal

folds increase quickly in the brief span of less than a year; the boy's voice may drop a full octave and the girl's pitch level may drop about three full musical notes. The pitch breaks expereinced by many boys changing through puberty are often annoying and embarrassing to the child and sometimes counseling is required for parents, his peers, and the child himself. These pitch breaks experienced during puberty need not be the clinician's therapy concern as they will usually disappear as the youngster experiences continued maturity. Focus on voice during puberty, including attempts at serious singing, should probably be avoided during these times of rapid voice change. I remember vividly my own experience as a boy soprano singing a solo in church the week I was no longer a boy soprano; puberty had struck with a swiftness that drastically changed my voice range, "falling from the treble clef to the bass clef in seven days." When the adolescent appears to have achieved some voice stability, voice therapy can begin in a similar pattern to the way one would conduct it with any adult.

Voice therapy for older children and adults. It is necessary to probe continually in voice therapy for the client's best voice productions. The clinician uses a number of voice facilitating techniques in her quest to find the patient's best phonation. Basically, the use of facilitating techniques to produce a good phonation is the core of what we do in symptomatic voice therapy for the reduction of hyperfunctional voice disorders. Such an approach involves the continuous search for "can do" vocal behaviors in each client. What may work well for one patient may not work well for another. The clinician must be familiar with a number of approaches and know when to apply them with individual clients. Each approach must be evaluated in terms of its possible effect on vocal fold mass/size and approximation as observed in changes of voice loudness, pitch, and quality. Taken from Boone's *The Voice and Voice Therapy* (2, p. 110) is the following chart which lists twenty facilitating approaches and the

TWENTY FACILITATING APPROACHES IN VOICE THERAPY

Facilitating Approach	Phonatory Process Affected		Parameter of Voice Affected		
	Mass/ Size	Approxi-mation	Loud-ness	Pitch	Quality
1. Altering Tongue Position		X			X
2. Change of Loudness		X	X	X	X
3. Chewing Approach	X	X	X	X	X
4. Digital Manipulation	X			X	
5. Ear Training	X	X	X	X	X
6. Elimination of Abuses	X	X		X	X
7. Elimination of Hard Glottal Attack		X	X		X
8. Establish New Pitch	X			X	
9. Explanation of Problem	X	X	X	X	X
10. Feedback	X	X	X	X	X
11. Hierarchy Analysis	X	X	X	X	X
12. Negative Practice	X	X	X	X	X
13. Open Mouth Approach	X	X	X	X	X
14. Pitch Inflections	X		X	X	X
15. Pushing Approach		X	X		X
16. Relaxation	X	X	X	X	X
17. Respiration Training		X	X		X
18. Target Voice Models	X	X	X	X	X
19. Voice Rest	X				X
20. Yawn-Sigh Approach	X	X	X	X	X

"X" indicates the particular Facilitating Approach effective for that particular Phonatory Process or Parameter of Voice.

Termination of voice therapy. It is always difficult to know when to terminate voice therapy with children. Successful voice therapy does not end with the sudden advent of "no more problem". Improvement is generally relative. If the client meets any or all of these criteria, it might be an appropriate time to dismiss him from further voice therapy:

1. *The voice sounds better.* If in the subjective (or objective, if this were possible) judgment of the clinician or client the client's voice sounds better (less dysphonia, appropriate loudness, normal pitch for age and sex), perhaps further therapy is not needed.

2. *The client reports fewer vocal symptoms.* If the client reports diminished or absent symptoms of vocal hyperfunction (pain, throat dryness, loss of voice with usage, etc.), therapy can perhaps be terminated. The client's own self-report of symptom presence or absence must be a major factor in all aspects of voice therapy.

3. *Reduction of additive tissue along the glottis.* If on indirect laryngoscopy, the original glottal lesion (thickening, nodule, polyp) is reduced in size or totally eliminated, formal voice therapy may be terminated. If it is predicted that further reduction of the lesion can be accomplished by voice therapy, then therapy should be continued.

SUMMARY

Voice therapy for children is usually successful in its attempt to identify abusive vocal behaviors in the child and then attempt to reduce the occurrence of these voice abuses. By using various facilitating approaches, we can help each youngster "find" and develop his own best voice.

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CHILDREN WITH VOICE DISORDERS: RATIONALE AND TREATMENT

By
William H. Perkins, Ph.D.
University of Southern California

What are voice problems? How are they recognized, especially in children? What can be done for them? Why are they more troublesome for clinicians to treat than, say, disorders of articulation? Such questions as these will be the subject of this discussion.

What Are Voice Problems?

Disorders of voice are defined by various authors with various exclusions. Some authorities include resonance defects along with phonatory difficulties. We will not, the reason being that resonance is a sound transmission process that is an integral part of articulation. It is distinct from the tone generation process of phonation. Were we to pursue resonance disorders, we would be into such problems as cleft palate speech. We will be sufficiently occupied if we restrict attention to phonatory difficulties.

Another delineation that will be a ground rule of this discussion: we will view voice disorders as phonatory rather than as laryngeal problems. Laryngeal pathology is the province of the physician, vocal function the province of the voice therapist. These two specialties share adjoining territories. As professional neighbors they must understand each other, but their areas of professional competence and responsibility remain distinct. The speech clinician cannot treat the larynx, but he can, and should, provide expert guidance about production of voice.

We have now narrowed our concern to problems of sound generation. Whether defective phonation reflects abnormal functions of a normal larynx or of a pathologic larynx, the problem that the speech clinician must manage is the vocal behavior involved. Note that we have not talked about "functional" or "organic" voice disorders. Strictly speaking, when vocal function leads to laryngeal pathology, as in vocal nodules, a functional disorder of voice exists, but the resulting condition is "organic." Let us, therefore, avoid this false dichotomy in considering the nature of voice problems.

Recognition of Voice Problems

How can voice problems of tone generation be recognized? For a problem to exist, it must somehow reflect failure of a performance to meet a criterion. Probably a basic reason why voice is more difficult than articulation for many clinicians is the lack of explicit goals for therapy. How should the voice sound? How should it be produced? Ask these questions about articulation and the answers are unambiguous. The clinician has cultural standards that specify the limits within which each phoneme will sound normal. Exceed those limits and the speaker is considered to have defective articulation. Not so with voice. Few clinicians have as clear a conception of how the voice should sound or how it should be produced as they have of how the sounds of American English should be articulated.

The argument here is that the goals of voice therapy can be as precise as those for any other disorder. To achieve precision, however, requires a criterion against which to assess the adequacy of vocal performance. Three possibilities are available. Probably the most popular, but most nebulous, is an *esthetic criterion*. Each of us has his own idea of "good quality." The difficulty is that people do not agree with each other as to what they like best, especially if they are from different socio-economic levels. To rely on the esthetic criterion would make the clinician the arbiter of vocal style. Not only are patients likely to disagree with a specific preference (some like soft voices, some like them loud; some like high clear voices, some prefer low rumbles), but clinicians are not likely to agree among themselves. For evidence of such disagreement, consider the difficulty "experts" exhibit when trying to describe the sounds of different voices. You can find over sixty terms in our literature, only two of which, "hoarseness" and "nasality," are used with much agreement in current texts on voice.

Adequacy of vocal performance can also be evaluated against the *acoustical criterion*, of adequate loudness. Obviously, a speaker must be able to generate enough sound to be heard, but this is an objective better achieved as a by-product of voice therapy than as a primary goal. Paradoxically, when the voice is defective, the more one strives for loudness the more vocal difficulties are likely to mount.

The remaining criterion of *vocal hygiene* is the most universally defensible standard against which to evaluate the adequacy of vocal production. Any form of vocalization abusive to the larynx would, by any conceivable standard, be undesirable – especially in children. Fortunately, esthetic, acoustical, and hygienic criteria are not incompatible provided vocal hygiene is accorded prime importance. An efficient hygienically produced voice achieves maximum loudness free of the esthetically unpleasant noises of vocal strain. Therefore,

we can take vocal efficiency that requires minimal vocal effort as the goal to be achieved in producing optimally hygienic voice.

Necessary Background

What should a clinician necessarily know about vocal production, laryngeal physiology and laryngeal pathology to work successfully as a voice therapist? Aside from the answer, "ideally everything," different authors will have different emphases. Briefly, the answer that we will elaborate is that the voice clinician should know how the hygienically produced voice sounds and feels. She should know enough about laryngeal physiology to explain to a patient or a parent what is happening in the larynx when the voice is being abused in contrast with when it is being produced hygienically. And she should know enough about laryngeal pathology to understand the vocal effects of various laryngeal disabilities as well as to talk intelligently with physicians who have vested interests in these problems.

Laryngeal pathology. Disabling laryngeal conditions can affect voice five ways:

1. they can disrupt synchrony of vibration and smooth approximation of the vocal cords (e.g., neoplasms can add mass to a cord thereby causing it to vibrate slower than the opposing cord to produce the rough sound of hoarseness);
2. they can change contractile ability of the cords (e.g., myasthenia laryngis impairs laryngeal resistance to air pressure that would make for a breathy voice);
3. they can limit abduction or adduction of the cords (e.g., adductor paralysis and interarytenoid growths can prevent closure of the cords for phonation, the results ranging from breathiness to whispering);
4. they can be endocrine imbalances that alter anatomy or physiology of the larynx (e.g., webs raise the pitch, virilization of the female voice lowers her pitch); and,
5. they can involve loss of essential tissue (e.g., laryngectomy eliminates the possibility of natural voice).

The different types of laryngeal disabilities that can produce the foregoing vocal effects are often classified by the laryngologist as lesions, paralyses, and manifestations of systemic diseases. Although the clinician need not know the histology of laryngeal lesions, she should know those that can be a consequence of vocal abuse. Inflammation, for example, can be a result of laryngitis and a common cold or of too much noise on the playground. On the other hand, laryngeal webs in children are invariably of congenital origin.

Benign tumors, such as fibromas, cysts, papillomas, angiomas, or lipomas are usually not considered to be a consequence of vocal abuse. Although improper use of voice may irritate them, they would not generally be expected to clear up with voice therapy alone. With polyps, on the other hand, vocal misuse is a major causal factor that interacts with upper respiratory infections, allergy, or hormonal imbalance. Very small polyps or polypoid thickening may resolve without surgical removal once vocally abusive irritation of the cords is eliminated.

Such benign tumors as these depend on their location for their effect on voice. If they are stem-based and hang by a stalk below the cords, they may interfere with phonation only when blown into the glottis; the voice can be clear, suddenly go hoarse, and suddenly clear again. If broad-based, their interference with voice will depend on their being located along the vibrating edge of the cord. In any event, surgical removal is usually required, but fortunately, with the exception of wart-like papillomas, benign tumors are not common among children.

Even more fortunate is the rare occurrence of malignant neoplasms in children. If, when they do occur, they develop on the vibrating cord, their prognosis is as good as for skin cancer. The warning sign of hoarseness can be heard early in development, and metastasis is slow. But if they occur off the cord, they tend to metastasize early but produce hoarseness so late that by the time of detection, they are at an advanced stage. The important issue for the voice clinician is that the nature of laryngeal pathology cannot be detected by ear. Hoarseness need not be a consequence of any pathology, but it is the earliest sign of the most serious, as well as the most benign, laryngeal difficulties. The safest rule is to refer for competent examination anyone, child or adult, who suddenly becomes and remains hoarse for more than a week.

Of the three most typical functional disabilities, vocal nodules are by far the most common among children. Polyps occur sometimes, and contact ulcers are almost exclusively an adult problem. In children, nodules are often called "screamer's nodes," and for good reason. Screaming or yelling is their major cause. They usually develop at school age about equally among boys and girls. Interestingly, among adults nodules are five times more prevalent among women than among men, presumably because of the higher pitches that women use.

Loud, constricted, high-pitched phonation is the combination of conditions in which nodules flourish. They develop as tissue reactions to irritation at the juncture of the anterior and middle third of the vocal cord. This is the point at which the mucosal surface is pounded

hardest by the colliding cords. The louder the voice the more powerful the collisions; the higher the pitch the more frequent the collisions; and the greater the vocal constriction the harder the vocal muscles between which the vibrating glottal edges are pounded. Nodules improve so often in children with vocal rehabilitation that surgical intervention is rarely required. Moreover, nodules tend to disappear at puberty, possibly because of lower pitches, possibly because of less yelling, or possibly for combinations of these and other reasons.

Rarely found in children are vocal disorders consequent to paralysis or systemic disease. When paralysis does occur, either congenitally or from injury, its vocal effect depends on the paralyzed position of the cords. If adducted, voice is possible, breathy as it may be. If abducted, even whispering will be difficult to achieve. The effects of systemic diseases that may be found in children are seen in altered laryngeal structure. Thyroid deficiency in infancy can retard laryngeal growth as well as result in cretinism. Gonadal disturbance in the male can lead to eunuchoid voice whereas virilization of the female voice can enlarge her larynx to male proportions with corresponding masculine pitch levels.

Laryngeal physiology. This brief discussion of laryngeal physiology is to provide the clinician with rudimentary information for understanding and explaining what happens to a patient's voice when it is defective, and the reasons for the techniques used to rehabilitate it.

Pitch is determined by the rate at which breath pressure overcomes laryngeal resistance to release glottal pulses of pressure. This rate is a function of the quickness with which the cords move open and closed (cord mass, length, and elasticity are the determinants) and of the duration of cord closure during a vibratory cycle (compliance, the softness and compressibility of the cords, determines this duration). Thus, such pathologies as inflammation or cord lesions that increase vocal fold mass slow the vibratory rate and lower the pitch. Conversely, laryngeal webs shorten the cords and raise the pitch.

Loudness is affected by the amount of energy released in each glottal pulse, so factors affecting cord closure and synchronous vibration are important: closure permits buildup of subglottal pressure for an explosive glottal pulse; synchronous vibration of the two cords is essential if they are to collide squarely and permit a period of closure to occur in the first place. With paralysis, for example, loudness is impaired because cord closure is insufficient to permit buildup of much pressure. Paradoxically, a fuller voice is often achieved in paralysis cases by reducing pressure, thereby permitting longer cord closure. With lesions that weight one cord more than the

other, loudness is reduced because the cords tend to vibrate asynchronously.

Quality is affected by vibratory symmetry. Any difference between the cords in mass, length, or elasticity will result in their vibrating at different rates. Such asynchronous vibration will be perceived as rough vocal quality. Because laryngeal pathology tends to impair both cord closure and vibratory symmetry, the resulting voice invariably is breathy and rough. This explains why hoarseness is the common early warning sign of all forms of laryngeal difficulty; hoarseness is perceived when breathiness and roughness are combined.

Let us turn now to the physiologic difference between hygienic and abusive production of voice. Two basic phonatory adjustments are possible for regulating pitch, loudness, and quality. One emphasizes muscular factors and is the basis of inefficiency and vocal abuse. The other emphasizes the Bernoulli effect of aerodynamic factors and is the basis of efficiency and vocal hygiene. With the muscular mechanism, pitch is raised by increasing cord tension to snap the glottis closed faster. This tension also has the effect of reducing compliance of the folds so that when the two hard glottal surfaces collide they bounce apart faster. Similarly with muscular control of loudness, the increased subglottal pressure required for louder voice is offset by increased cord tension, an adjustment that tends to make increased pitch accompany increased loudness. Note that this muscular adjustment is the mechanism that was described for the production of vocal nodules and other consequences of vocal abuse.

The aerodynamic mechanism, by contrast, relies less on cord tension and more on the Bernoulli effect to regulate pitch and loudness. Increases in both pitch and loudness are accomplished by "sucking" the cords together faster aerodynamically. Thus, the cords are more compliant, being relatively relaxed, so their collisions are less abrasive and less likely to result in tissue damage. This is the mechanism, incidentally, that professional singers and actors utilize to preserve their voices under the most severe tests of vocal endurance.

Vocal behavior. Optimally hygienic vocal production sounds and feels different from vocally abusive production. Oddly, more objective descriptions can be given of how the voice feels different than of how it sounds different. A listener who has heard the two types of production can recognize characteristic differences, but to describe them to someone unfamiliar with them is all but meaningless. Such terms as "smooth, clear, full, resonant, effortless" are appropriate for the sound of an efficient voice, whereas "rough, thin, strained, harsh, and strident" are among dozens of adjectives that have been used to describe inefficient voices. The trouble is not with the metaphoric

nature of these terms but rather with the fact that few, if any, are used with the same meaning by authorities on voice let alone by most clinicians.

We will, therefore, concentrate on how the voice should feel when it is produced hygienically with an aerodynamic adjustment. These feelings accompany responses that can, for the most part, be easily obtained by children as well as adults. The emphasis will be on how the voice should feel when produced efficiently rather than on how it feels when defective. The reason is that voice can be misproduced an infinite number of ways, whereas efficient production has some common features that should be achieved if vocal hygiene is to be preserved.

Basically, six dimensions of voice are controlled, wittingly or unwittingly, for every vocal sound regardless of how efficiently or inefficiently it is produced. Each dimension lies along a scale that can be readily identified. Thus, the dimension of *pitch* extends from high to low, *loudness* from loud to soft, *voicing* from voiceless to voiced, *constriction* from closed to open, *focus* from unbalanced to balanced, and *mode* is the basic vocal adjustment of pulsated voice (vocal fry), heavy voice (chest register), or light voice (falsetto).

The culprit in all forms of abusive vocal production is constriction, the mark of a muscular adjustment. Because this physiologic mechanism is utilized for all other vocal dimensions, they can be utilized to reduce constriction. The idea of optimal pitch, for instance, is valid to the extent that constriction is minimized in the lower midpitch range when voice is produced with a muscular adjustment. Similarly with this mechanism, as loudness decreases, so does constriction. Essentially the same is true with voicing; a soft breathy tone permits less constriction than one that is fully voiced. As for mode, heavy voice can allow greater constriction than either light or pulsated modes. Finally with the vocal focus dimension, vocal production cannot be balanced when constriction prevails (its presence indicates that the muscular mechanism predominates). The greater the constriction the greater the feeling that the voice is focused in the neck; when constriction is high the voice feels as if it is being squeezed from a throat that is almost as tight as in a swallow.

By contrast, hygienic production is free of constriction; it feels as effortless as quiet breathing. Because an aerodynamic mechanism is utilized physiologically for all dimensions, constriction is minimal and therefore does not interact with any other dimension as it does with a muscular adjustment. The voice is characterized by flexibility and a wide range of optimal pitch, loudness, and voicing levels. The throat feels as open in heavy vocal mode as in quiet breathing follow-

ing a yawn. This sensation is obtained in pulsated voice when the vocal fry is produced with a very slow series of explosive pulsations. (A vocal fry at a pulse rate above 30 per second does not offer a model of how the throat should feel during optimal production.) The most unambiguous identification of an aerodynamic adjustment, however, is the feeling that the tone is focused high in the head above the nose. This is the focus achieved when a high light falsetto tone is produced effortlessly. With this high focus, the voice is in balance regardless of the mode in which it is produced. Whereas pitch and loudness increases in a muscular adjustment are accompanied by throat-tightening constriction, in an aerodynamic adjustment they are accomplished effortlessly. No feeling of change in the neck occurs because the tone seems to float in the head while the throat remains as uninvolved as in easy breathing.

Assessment

Expedience is the only justification for limiting the foregoing discussion to background in laryngeal pathology, laryngeal physiology, and vocal behavior. These areas provide the rationale for setting the goal to be achieved in voice therapy. For the management of voice problems in children, however, the clinician should know the history of how the problem developed, the environmental pressures that may still be maintaining it, and the nature of the child's personal adjustment to his world. In fact, these are the areas of the child's life that the clinician is most likely to manage for the successful achievement of vocal hygiene. We will, therefore, include them in this discussion of assessment.

Medical Diagnosis

The status of the larynx is of prime concern to the voice therapist but is not within his province to determine. Medical diagnosis is particularly relevant to the assessment of voice disorders for two main reasons. First, hoarseness is often the earliest evidence of laryngeal pathology and sometimes of neuropathology. When a lesion is malignant, early detection is paramount. Second, the speech pathologist is in no position to determine the basis of any hoarseness he may detect. It can result from inefficient use of normal vocal cords, or from asymmetrical vibrations of pathologic cords. Further, medical information is needed on the metabolic status of the child and of his vocal tract. Does he suffer from asthma, allergies, or chronic upper respiratory infections that keep the cords chronically inflamed, hence especially vulnerable to tissue damage from vocal abuse? Until the clinician has medical clearance for voice therapy, she risks initiating treatment that can harm rather than help. Ideally, she would have

this clearance prior to assessment, but certainly she should have it before beginning treatment.

Vocal Analysis

The first and foremost responsibility of the speech clinician is to determine if the child's use of voice is abusive or hygienic. This judgment is independent of the medical diagnosis. Although the presence of nodules is presumptive evidence of vocal abuse, pathology need not exist as justification for voice therapy. Prevention can be as compelling a reason for treatment as can rehabilitation.

Too, the child may use his voice efficiently under some conditions and not under others. He may use an abusive muscular mechanism when screaming and yelling at play, whereas in quiet speech his voice may be produced optimally much of the time. Clinical judgment is required to determine how much vocal trauma each child can endure. Some have "cast iron" vocal cords that will resist endless pounding whereas others develop tissue reactions with the slightest misuse.

Although the vocal analysis can proceed systematically, dimension by dimension, what is to be observed is the effect on vocal balance and constriction of variations in each dimension. The clinician should listen especially for how rough or smooth the voice sounds at different levels of pitch, loudness, and voicing. A telltale sign of constriction is heard when the voice shuts off on downward inflections at phrase ends. Those pitch, loudness, and voicing levels at which the throat feels most open and the tone is produced with least effort are the ones to be encouraged in therapy.

This analysis should be made of what the child can do when he voluntarily controls the various vocal dimensions and also of what he does under normal speaking conditions at home, in the classroom, and on the playground. Although the analysis is made in the child's normal vocal mode (heavy voice), his ability to produce voice in pulsated and light modes should also be explored during assessment; use of these modes can be of considerable therapeutic value when they are easily available.

History and Environmental Analysis

Because the child is often oblivious of his vocal difficulties, the history of his problem is usually obtained from concerned parents and teachers. A history is especially important if a laryngeal examination has not already been completed. Such questions as follow will help to reveal whether laryngeal pathology has suddenly developed, thus making medical referral urgent, or whether the problem may reflect long standing misuse of the voice. Who first noticed the

problem? What signs of difficulty were heard? Did it start suddenly or gradually? Did it follow shouting, yelling, or singing? Did it develop after an illness? How long has it existed? Does its severity vary during the day? With different people? With different places or activities? With different feelings? With fatigue? Does the child sound like any of his family or friends?

The history can reveal the probable conditions under which laryngeal pathology may have developed. The more important issue, though, is what conditions prevail currently that help perpetuate vocal abuse and any pathology that may exist. How large and talkative is the child's family? Does he have trouble commanding their attention? Does he yell or scream much at home, at school, or on the playground? Does he sing? How much? Such questions can be revealing of conditions that must be altered if rehabilitation is to succeed.

Personal Adjustment

Vocal abuse in children is often a consequence of their reaction to frustration. Valuable as a battery of personality and personal adjustment tests may be, the crucial determination is the child's vocal response to his living conditions. Under what circumstances does he constrict his voice? Speak too loudly? Yell or scream? Generally, the more insecure the child the wider the range of situations that will disturb his voice. Still, we need not infer that a child who abuses his voice is insecure, even though typically this may be true. Conversely, we need not assume that an insecure child will have a voice problem. The operationally important information about personal adjustment can be heard in his vocal responses to daily life.

Therapy

Surgical Decisions

The speech clinician does not participate directly in the treatment of laryngeal pathology, but she should know the physician's considerations that are pertinent to her work. His primary concern is to restore the child's larynx to as healthy and normal a condition as possible. Because surgery involves permanent tissue alteration, he will probably avoid it, especially in children, if voice therapy offers any possibility for recovery. Fortunately, the most common pathology in children, nodules, responds well to vocal rehabilitation. The earlier in nodular development that therapy is begun, the better the chance of avoiding surgical intervention. Large fibrotic nodules of long standing may require removal.

Should surgery be necessary, the physician will probably recommend a period of vocal rest to promote healing. Duration of this

period will vary with the lesion. For nodules, complete silence may be recommended for one to two weeks. Longer periods are usually avoided because of the personal strain of refraining from speech. The alternative of whispering should be strongly discouraged; it is usually abusive. Although longer periods of silence might facilitate healing in some instances, the gains tend to be outweighed by the loss of muscle tone in the cords. Vocal rest has no therapeutic value beyond promoting healing.

A period of silence may also be used for a week or two to permit absorption of nodules and reduction of inflammation. If improvement of the cords is seen, voice therapy will likely be recommended instead of surgery. Until the larynx is fully recovered, the child should use his voice as seldom as possible, and then only with a soft breathy tone under quiet conditions. Again, whispering should be avoided.

Preliminary Decisions

When a child is seen for voice therapy, the reason is usually because of vocal abuse. If inflammation, nodules, or polyps have resulted, treatment should be undertaken in consultation with the examining physician. Decisions should be made as to whether voice rest is needed, how complete it should be, and for how long.

As for reduction of vocal abuse, the clinician has three approaches that can be used singly or in combinations. She may attempt direct modification of defective vocal habits. Because this option requires considerable attention and diligence that is likely to be in short supply with children, it may not be the approach of first choice. Still, none of the other alternatives are designed specifically to alter faulty vocal production, so vocal rehabilitation will probably be required sooner or later during treatment. We will elaborate on it shortly.

A second approach is to view the child holistically. The voice problem is then seen as a manifestation of frustration that stems from inadequate personal adjustment. This view has considerable validity. As a child becomes more secure, his voice will often improve without direct attention to it. Such changes cannot be anticipated with certainty, however, because they are by-products of procedures aimed at holistic rather than part-function goals. For those clinicians equipped to undertake psychotherapy, this approach can greatly increase the probability that any improvement achieved will be maintained permanently. On the other hand, its effects are usually slow to be seen, so it cannot be expected to yield early relief from vocal abuse. Psychotherapy is far too extensive a topic for this presentation. Those who are not already skilled in its use and who wish to prepare themselves for it will undoubtedly want to do more

than dabble in it. Therefore, we will not pursue it further.

The third approach that is recommended for initial treatment of all voice patients, and particularly children, is environmental therapy. The immediate concern is to reduce vocal abuse. The most expedient method to do this is to alter the conditions under which voice is used. Let us examine this approach in more detail.

Environmental Therapy

From the assessment, a clinician should have a clear picture of those situations that are currently contributing to vocal abuse. These are the prime targets of environmental therapy. The immediate goal is to create temporary circumstances in which the child will not be compelled to use more than a soft breathy tone. One of the most effective methods of achieving this goal is to permit speech only when the listener is within three feet of the child. Distance between speaker and listener exerts such powerful control of loudness that no amount of coaxing, wheedling, or pressuring will maintain the desired soft voice if the child must make himself heard over more than a few feet. If conditions are noisy, such as on the playground or in a car, the child may have to speak directly into the listener's ear.

Admittedly, this is an emergency procedure that is not expected to continue for more than a few weeks. If the clinician issues these instructions with all of the authority that she can muster, the child can utilize her request as the equivalent of "doctor's orders." Even the most insecure child can insist that his listener be close because "teacher says so." Aside from the obvious vocal benefit of minimizing abuse (almost as much as would vocal rest) and the benefit of initiating a rudimentary form of hygienic production, this strategy can also introduce the child to a new realm of social interactions. Screaming and yelling are vocally damaging protestations that the child's listeners should take note of him, but don't. When his strategy suddenly shifts for such a respectable reason as his vocal health, he is likely to discover that he can command greater attention and respect with a quiet voice than with screeching. From such beginnings can come new interpersonal alignments at home, at school, and at play.

This preliminary period of quiet speech affords time to perfect and strengthen use of a hygienic voice in the clinical setting. It also affords time to analyze and alter those aspects of the child's environment that would otherwise tend to force the child back into his old patterns of vocal abuse. Some improvements will be relatively easy. In class, the child can be moved closer to the teacher if much verbal interaction or recitation is required. Or consider the child, for example, who became hoarse each fall and improved after New Year's. He was an insecure boy whose adored uncle was a famous football hero.

Naturally, the boy screamed himself hoarse at every home game. He was given the option either of not attending or of restraining his vocal enthusiasm.

Other improvements will be more difficult. The loudness level of a whole family may need reduction. A family in which all of the members are talkative and loud is likely to be one that will require attention if a child is to be expected to speak quietly at home. Family counseling to enlist the cooperation of all members in monitoring themselves and each other for loudness can be helpful.

The playground, however, is usually the most troublesome to improve. Play and quiet speech are hardly compatible, so a clinician's ingenuity is likely to be taxed to find a workable solution. One requirement is that it not sacrifice the child's status among his peers for the sake of his voice. Ideally, the solution should elevate his status. As an example, hand signals can be substituted for screamed commands. A whistle can be used to call attention to his signals. If additional "clout" is needed, a playground leader can be enlisted to help enforce attention. The operational test of a viable solution is whether the child uses it with enthusiasm or resistance.

Voice Therapy

The object of voice therapy is to establish hygienic vocal production on a permanent basis. Many techniques are available that are intended to facilitate work toward this goal, but they vary in therapeutic power. We will look at a selection of strategies that have proven effective among student clinicians in replacing abusive muscular vocal adjustments with optimal aerodynamic adjustments. The abundance of procedures bespeaks the lack of satisfaction in the success of any of them. Skillful use of a few methods that work well will yield much larger therapeutic profits than will casual use of a large selection of techniques that are utilized without a clear conception of their purpose.

Obtaining vocal balance. Vocal balance should be established in the clinical setting within the first or second session so that the child can have a reasonably clear idea during the emergency period of "soft voice" of what he should be doing vocally. Ideally, the new voice will be strengthened and ready to use in daily speech by the time the emergency procedures begin to wear out. With a vocally balanced aerodynamic adjustment, the child will be able to use his voice at normal loudness levels without abuse. Until such balance is achieved, however, he should continue to use his voice as if everything he says is confidential and to be heard by no one but the listener. If he abandons a quiet voice before he is ready to replace it

with his new one, he is likely to undo therapeutic gains faster than they can be built in the clinic. With loudness goes constriction and with constriction goes vocal abuse.

With vocal balance, vocal efficiency is achieved: maximum voice is produced with minimal effort. Therefore, the first objective in obtaining balanced production is to establish that the throat should feel as open and relaxed as in quiet breathing following a yawn. This feeling can be demonstrated by constrasting the peak of a swallow with the peak of a yawn that is then allowed to trail off into easy breathing through the mouth. The yawn is an important prelude to insure removal of constriction, and mouth breathing is to approximate the feeling of air stream direction for speech. An equally powerful alternative to the swallow-yawn contrast is to clench the jaw and tighten the base of the tongue; then let the tension "drain" slowly from them until the tongue "tingles" during quiet breathing.

The next step is to add articulatory movements without losing the feeling of an open throat. This can be done by having the child begin to count slowly while articulating without voice or whispering. If his throat begins to tighten, he should cycle back to the beginning with a swallow-yawn or tongue tightening and then re-extend the open throat until he can count silently without constriction. Once mastered, he then should recycle through the silent counting and begin to add very soft tone around the count of five. Whispering should be avoided. If he has maintained an open throat, he will feel as if the tone is produced in his head, not in his neck.

The feeling of location of the tone is the strongest clue as to which phonatory mechanism is being used. The higher the tone feels in the head and the greater it seems to float freely above the throat, the more the aerodynamic mechanism predominates. Conversely, the more it seems to be squeezed from the throat the greater the muscular adjustment.

The objective throughout this procedure, of course, is to gradually increase the complexity of voice usage without losing the feeling of quiet respiration. Thus, as soft counting proceeds, the child should be asked to make the tone fuller without increasing effort. A request for loudness is avoided because increased effort usually accompanies it.

Two other techniques can be utilized to supplement this approach to vocal balance. One utilizes pulsated vocal mode (vocal fry), the other light mode (falsetto). Both of these modes when used properly maximize use of an aerodynamic mechanism. With vocal fry, the objective is a slow series of explosive pulses. The effect of constriction on this mode is to speed up the pulse rate. Children often use this mode to produce motor boat sounds, so it can be achieved within

the context of a game. When the slow pulses can be produced on an isolated vowel with ease, the desired vocal adjustment is ready for transfer to the normal heavy vocal mode. This can be accomplished by producing the desired vocal fry, taking an easy breath, and then counting quietly in heavy voice.

Use of light mode is dependent upon obtaining a soft light falsetto tone that feels as if it floats high in the head. This sound is sufficiently unusual that children, as well as adults, are often intrigued by it. Until it is mastered, a special tactic may be necessary to obtain it. This involves use of /ŋə/ which will sound a bit like a nasal snort. The child should develop skill in flicking the sound out in heavy mode before trying it in falsetto. The purpose of this tactic is to position the articulators so that the initiation of the tone is felt behind the nose before any throat tightening can occur. If sustained light voice is attempted before the tone is firmly established in the head, it will tend to be produced with constriction.

When the falsetto feels as if it is floating free of the throat, the initial /ŋ/ can be progressively prolonged and extended into an open vowel. The child should then start counting slowly in this soft light voice. If vocal alignment remains intact after the count reaches five, he should continue by progressively lowering the pitch with each count. If the focus of the tone remains high and it is kept soft and breathy, the transition from light to heavy mode will be made without a break in the voice. If a break does occur, it indicates that the tonal focus has slipped or that the voice is too loud. The purpose of using light voice is to transfer the feeling of its production to normal heavy voice. Thus, once the transition into heavy voice has been made smoothly, counting downward should continue until a comfortable pitch level is reached. Counting then continues at that pitch as a test of the child's ability to preserve the vocal balance that he will have automatically if the light voice focus is maintained.

Use of the foregoing procedures for obtaining vocal balance can be circumvented to some extent if careful observation reveals that the child sometimes uses his voice efficiently. The task with this approach is to contrast what he does when the voice is produced hygienically with what he does when it is abused. Role playing is another tactic for obtaining optimal vocal production. This requires exploring for the roles that will yield the desired voice. These approaches are likely to be more effective if used in conjunction with such explicit procedures as a swallow-yawn or tongue tightening to give a clear idea of the effortless feeling that should accompany vocal production.

Generalization and permanence of vocal balance. When the child has sufficient control of his voice that he can voluntarily contrast

hygienic and abusive production during counting, he will have demonstrated vocal mastery under conditions of phonetic complexity. Counting is utilized initially because it offers phonetic variety without the distraction of reading or conversation. More important, it is free of inflectional changes, the next level of complexity to be mastered. This step tends to pull the voice out of balance, so the child must be prepared to stop at the first sign of vocal constriction, return to a level that he can master, and re-extend his new voice as far as he can. Use of nursery rhymes or other material that permits the child to attend to his voice rather than to what he is saying is recommended. This can be followed with reading and conversation. To proceed through these generalization steps faster than the child can consistently succeed with them is to retard if not prohibit therapeutic progress.

Until now, the child should be using his soft voice in daily living. When he has mastered his new voice with his clinician in his therapy room, he is ready to start generalizing it to more socially complex situations. Begin by bringing another clinician into the room, then a parent, friend, or teacher. Change rooms in the same building, including his classroom, first with no one present, later with the teacher and finally with the class. The same with the playground and at home. If failure occurs, he should return to soft voice until he can succeed with his new voice.

These are big changes. If they are not made in small steps, the probability of the child losing control of his new voice is increased. A realistic test of the difficulty of each step is the ease with which the child succeeds. A failure indicates that the step is too big and should be taken in smaller increments. For instance, if he fails in his first attempts at home, bring his family to his therapy room and establish firm control there. Then have him use the new voice at home with only one of his family at a time, starting with the easiest and proceeding to the most difficult member.

Complete generalization does not guarantee permanence. Like any motor skill, the new voice will not become permanent until it is sufficiently automatic that the child does not have to think about it much to maintain it. The fact that he can use it successfully in all situations during terminal stages of therapy does not insure his continued success when his attention is diverted. Thus, therapy should not come to an abrupt halt but should be phased out with increasingly longer times between checks. If the clinician has arranged the child's life situations so that he is well reinforced for his new vocal skills, permanent generalization of his hygienic voice is probable.

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IDENTIFYING AND MANAGING VOICE DISORDERS

By
James C. Shanks, Ph.D.
Indiana University Medical Center

As our topic implies, voice disorders must be identified before they are managed. In this discussion two underlying assumptions need to be spelled out. The first assumption is that full understanding of voice disorders requires three separate points of view. An analogy might be made to a three-legged stool. Just as he who attempts to use a stool without one of the three legs will surely fall on his–face, so we must utilize three points of view in appreciating disordered voice. The first point of view is physiologic. This view uses visual observation of the structure and function of the voice mechanism, either directly or through radiograph. The second point of view deals with the feelings of the speaker – not only his feelings about his voice, but his attitudes about all topics. The third point of view encompasses the vocal habits manifested by the speaker in speaking and singing.

Although observation of the larynx and palate is not restricted to the physician, we speech pathologists usually need special training in order to appreciate what we have seen, even if we become proficient in the use of a laryngeal mirror. By the same token, although the feelings of the speaker are not the exclusive domain of the psychiatrist, we need to develop extra sensitivity in the detection of feelings and attitudes, as well as the symbolic implications of vocal usage. Traditionally we have thought of the understanding of vocal use as our prime responsibility. However, again this is not our province alone. Habits may be ascertained by the laryngologist, plastic surgeon, psychiatrist, or by vocal teachers.

There are several implications stemming from this basic assumption. The first has to do with the frequently repeated observation that we should not proceed in voice therapy until there has been a laryngeal examination. Such a statement is not intended to feather the nest of the laryngologist. Rather, it implies that an understanding of the physical condition of the larynx must precede an interpretation of vocal habits which we hope to alter. At the same time we must note that many voice cases never get to us – having been identi-

fied and managed by the physician only. Secondly, although we may not always like the tendency, there is good reason to consider voice disorders in terms of the laryngeal pathology which is to be observed. Thus, traditionally, texts tend to discuss voice disorders in terms of specific structural or physiologic changes in the larynx. In the third place, we need not – indeed, should not – accept every casual or incomplete description presented by a physician. Often we accept a physician's diagnosis of plica ventricularis or submucous cleft palate without receiving adequate description of the appearance and behavior of the larynx or palate. We have a perfect right to request detailed and accurate observations prior to the assumption of our own primary responsibility. To the extent that we accept incomplete statements, we penalize our own efforts.

The assumption also extends implications to an understanding of the patient's feelings. If a psychiatric or social evaluation has not preceded our analysis of vocal habits, we should consider the evaluation of feelings about which we have uncertainty as a logical and reasonable recommendation to be carried out before the assumption of voice therapy. Such an evaluation of feelings may be carried out by a surgeon! In his book, *Psychocybernetics*, Dr. Maltz, a plastic surgeon, reveals that no matter how fine the result to his eyes, his cosmetic surgery was not truly successful until he ascertained the self-image and view of results as seen by his patient. To the extent that we feel proficient in understanding people and their feelings about themselves and their voices, however, we should not feel the need to deposit at the psychiatrist's door every responsibility for observing and recording impressions and interpretations about the feelings of the speaker. We are not usurping the psychiatrist's prerogative when we note the temporal relationship of emotional trauma and the emergence of disordered voice.

The second assumption concerning voice disorders relates to the significant parts of the speech tract which require observation. Traditionally we have divided the function of speech into four processes: respiration, phonation, resonation and articulation. It is essential that a study of voice recognize the interplay between all four processes. In particular, phonation should be thought of as an interplay or balance of respiratory and phonatory forces which are modified in the resonators and by articulatory positions and movements. The site of disordered voice is not restricted to the larynx. One implication of the interplay of processes has to do with our assessment of vocal habits. In the first place, although we judge the totality as it emerges from the mouth, often we attempt to assess each process individually. Secondly, by training we are best prepared to assess vocal habits on the basis of our frail human ears. This auditory per-

ception which we bring to our job is very much in need of a yardstick against which to compare the performance of a given speaker. Thus, as I see it, one role which I hope to perform at this Institute is to share with you an auditory experience of certain ordered and disordered voice in order that we may better establish our yardstick.

Parenthetically, it has been tempting to many of us who work with voice problems to establish some type of tape recorded signals in an effort to provide a yardstick. It may be noted that there are increasingly successful efforts to define parameter of degrees of hoarseness, such as in work done by von Leden. However, at this point it does not appear reasonable to use an acoustic signal as a means of training auditory perception to make diagnoses of physical conditions with any degree of certainty. As yet, perception is not a substitute for visual observation and diagnosis.

By way of illustrating the interplay of processes here is an unusual sample of voice. This man has an exteriorized larynx. He had extensive cancer which required the alteration of his vocal tract above the larynx. Accordingly, the larynx was moved such that the vocal folds are located on the surface of the neck. The result is an elimination of resonation and articulation as we think of them. Note the variations of pitch which seem to effect articulatory variation.

Before considering instances of disordered voice, perhaps we should attempt to identify characteristics of good or normal voice. These characteristics frequently are parameters of good vocal function, not just parameters of dysfunction. Four parameters are available for our assessment: pitch, loudness, time, and quality. In assessing pitch we should be aware of the maximum range, as well as the range usually employed by a speaker in conversing or singing. This range may be demonstrated in step fashion, by singing up the scale or with continual change as in rising and falling inflections. Thus, we may ask an individual to proceed from his lowest to his highest note. Clearly, habitual range should hover in the upper part of the lower half of one's range. The maximum range should be 1½ – 2 octaves with habitual range of about half an octave. Although we may not think of a maximum range of loudness as highly desirable, certainly a variation of loudness should be available for a speaker to meet varying demands of ambient noise. In this voice assessment we may be guided by the principle that he functions best who functions least. Thus, a characteristic of good voice involves the easy initiation and continuation of voice of very low intensity. Likewise one's habitual range of intensity for most situations should show some variation. It may be noted that pitch and loudness are, or should be, independent parameters. Thus, one should be able to say a sentence, or count to 10, (1) in a soft, low voice, (2) in a soft, high voice, (3) in

a loud, low voice and (4) in a loud, high voice. The third parameter of voice, time, may be assessed in at least three ways. The first has to do with the speed of onset of phonation. Here our concern is that voice NOT be initiated too quickly. One may develop an analogy of a car preparing to resume driving when a red traffic light turns green. In the extreme we have two alternatives: (1) no braking or accelerating til the light turns green, then moving forward gradually correlated with a slow feeding of gas or breath, or (2) by flooring the accelerator while firmly depressing the brakes. As the light turns green the first car moves away slowly, with gas determining the movement. The second car makes a jackrabbit start as the brake is suddenly released. These two onsets of car movement parallel the respiratory and glottal release of tone by a speaker. Clearly, we should seek to avoid the unduly rapid or glottal initiation of phonation. A second dimension of time has to do with maximum sustained duration of phonation.

Here we hope to prolong tone for at least ten, perhaps twenty or more seconds. The third characteristic of time has to do with the total amount of talking time or singing time in a given period, such as a day. The fourth parameter of voice has to do with quality. What we agree as being a pleasant resonant voice may be described as having full use of overtones, an optimal balance of tensions in the larynx-to-lip tube, as well as within the larynx itself.

How then may voice be disordered? There appear to be four ways in which voice is impaired by laryngeal function. The first type of disorder results from an imbalance in the force of subglottal air being met and resisted by the vocal folds. In the second type of disorder the contour of one or both vocal folds is such that vocal fold approximation is not feasible. In the third type of disorder, although a balanced vocal fold approximation is possible, it is not used. In the fourth category of disorders one cannot, seemingly, achieve either muscular balance or vocal fold approximation to produce voice. Each type of disorder will be considered in detail.

A. Some voice disorders appear to be the result of an imbalance in the force of air driven up from the lungs and the resistance provided by the vocal folds. There appear to be three variations on this theme. In some cases the general level of respiratory force and laryngeal resistance is too low, or without enough variation. Thus, the patient with Parkinsonism has a weak voice which is diminished further in intensity as he continues to talk. There appears to be both a weakness of respiratory power and phonatory resistance.

A slightly different manifestation appears in the voice of deaf people. It has been noted that some deaf people have not learned that it is necessary to send air up against a resisting larynx in order to speak.

Monotony and lack of vocal variation appear to be the result of a flat, poorly monitored respiratory-phonatory balance.

A second type of imbalance results when one or both of the vocal folds has been paralyzed, especially the adducter paralysis. The key lies in the position of the paralyzed vocal fold. If, as rarely occurs, the cord is in, or close to, the midline, voice can be produced with not too much effort. However, when the vocal cord is fixed in the paramedian position, voice results only when the non-affected cord can approach the paralyzed cord sufficiently to resist the uprushing column of air. Paralysis may result from a wide variety of causes including damage to the nerve by a disease process, or, as happens occasionally, with an accidental severing of the recurrent laryngeal nerve. The following tape illustrates the voice produced by a sixty year old woman whose recurrent laryngeal nerve was severed accidentally during thyroidectomy.

The unilateral adducter paralysis further illustrates the interplay between respiration and phonation. Although some success has been reported for such indiviudals by the injection of teflon in the paralyzed vocal fold, thus causing it to bulge and approach the non-paralyzed fold, such a bulge is achieved at the risk of threatening respiration. The lady whom we just heard already has a threatened airway as evidenced by her tendency to wheeze during inhalation. To further occlude her airway by means of injecting the paralyzed cord was rejected by the laryngologist as too dangerous. It may be noted that temporary alteration of voice may be effected by the digital pressure applied at the lamina of the thyroid cartilage on the affected, or paralyzed, side. In so applying medial pressure the posterior portion of the vocal fold is brought closer to the midline with a resulting improvement in the loudness and quality of phonation. It may be noted further that the individual who has a partially restricted airway is most apt to feel this threat to respiration and to be most apprehensive about breathing. Such apprehension may well over-shadow feelings of embarrassment about the dysphonia itself. The following tape, made of a sixteen year old girl with Amyotrophic Lateral Sclerosis, illustrates a general muscle weakness. Although hypernasality is striking because the velum did not move at all, there is also a dysphonia as the patient wastes breath in attempting to voice and talk.

A third form of respiratory-phonatory imbalance appears to be the result of excessive tension within the larynx. The individual who has spastic dysphonia appears to "stutter with his vocal folds" as he speaks; a spasm in the folds results in an elevation of pitch, at times causing cessation of phonation. This disorder has many psychological components; nevertheless, increasing evidence indicates a neuro-genic basis for spastic dysphonia. Although the condition is generally

associated with adults, it can occur in children. The following tape is of a young lad we saw several years ago. At first he demonstrated the typical spasm of phonation in connected speech, with some characteristics of avoidance such as might be found in secondary stuttering. At first we tried to minimize the different voice. Somehow he changed his hypertonic function such that he developed a vocal nodule. Relaxation and a breathy attack were stressed, leading to the elimination of the vocal nodule. Some time later the spastic dysphonia became more pronounced. This time the dysphonia was attacked directly with an exaggerated sigh. The problem was ameliorated only when the family moved to an environment in which the boy felt more comfortable and accepted. This relatively rare disorder has elements of anger and frustration, either as a result or a cause of the dysphonia. Imagine the feelings of a young woman who experienced spasms of the vocal folds while working as a buyer in a department store, a position which she detested. After she became a teacher she was acclaimed for her ability to discipline and control a class. This discipline stemmed from the fact that she had discovered that the spasm was less apt to occur when her level of loudness was kept low while talking to the class. She talked softly and carried a big stick. Imagine also the frustrations of a man who, in addition to being a priest, had earned a Ph.D. in speech. His position as a faculty member in a Seminary was impossible after the emergence of the spastic dysphonia.

A condition about which one can be even more pessimistic in terms of correction is myaesthenia laryngis. This condition is so fraught with croaks and squeaks that the speaker appears to be unable to talk. Note the similarity of the spasms and general level of effort of this woman whose spastic dysphonia appears to approach a level of myasthenia laryngis. It may be noted that seldom do spastic dysphonia or myasthenia laryngis result in a cure. Dr. Godfrey Arnold notes that in one "cured" case in his practice, he made the mistake of asking the speaker to imitate his former disorder. Unfortunately, the man faked his spastic dysphonia so well that what began as a voluntary activity converted into an involuntary return of the dysphonia.

Although disorders of register are difficult to fit into most outlines of dysphonia, there appears to be some logic in their inclusion under the heading of balance of phonatory and respiratory tensions. Most of us trained in speech pathology have relatively little appreciation for the general concept of register. In this we turn to practitioners of art rather than science, and find vocal teachers utilizing terms such as head register and chest register. The chest register is the usual range of voice exhibited by speakers and singers in their habitual voices. This is true whether you sing soprano, alto, tenor, or baritone.

The following tape presents samples of chest and head register as sung by the same person.

Although there is undoubtedly a quality of modal or head register, this concept seldom comes into play in dealing with the speaking voice. However, two extremes in the pitch range do illustrate registers which are not head registers and with which we should be familiar. Although the falsetto is sometimes identified as a disorder of pitch, it may be equally thought of as a normal register resulting from changed tension of the vocal folds. The coronal section of the vocal fold, such as revealed by a tomogram, indicates a thinner vibrating mass of the vocal folds. This reduced mass is said to be effected by increased contraction of the thyro-vocalis muscle while the thyro-muscularis or glottal edge is relatively relaxed. This interpretation is based on the observation that only the medial edges of the vocal folds are seen to vibrate, that the lateral excursions of the folds are reduced and that there is marked tension at the posterior edges of the vocal folds which become progressively damped.

At puberty a boy has the chance of having his pitch descend with the growth of the length and mass of his vocal folds. However, at this time he may effect a mutational change in which the pitch goes up. The speaker who habitually uses a falsetto has been associated with a certain amount of riducule stemming from a presumed connection to homosexuality. However, even when the psychiatric evaluation fails to reveal such disturbances of male/female identification, the individual may acclimatize his ear to the high, falsetto pitch. The following tape was made by a man, 32 years of age, who had spoken this way ever since he was afflicted with severe laryngitis at 15 years of age.

The next tape is of a boy at 15 who had not dropped his pitch after puberty. In the case of the first speaker, there was an absence of any significant disturbed affect. The second boy, however, tended to have some confusion. His success in reducing his level of habitual pitch was greater than his ability to modify the effeminate prosody pattern which he had attained during the period of using the falsetto. It may be noted that in using the falsetto the larynx is apt to be elevated, that the laryngologist finds a larynx of normal size. Although digital pressure at the thyroid notch may succeed in holding the larynx down, the over activity of the supra-hyoid muscles can be negated by another simple maneuver: extending the head back as far as possible (call for a demonstrator from the audience) G. Peacher made the observation some time ago that in cases of known homosexuals, lowering the pitch was not enough to establish normal voice, that there were melody patterns which needed to be altered also.

For those who remember the dysphonia term "dicrotic", it is interesting to see that speech pathologists have now identified this

condition as a true register at the lower end of the pitch scale. The glottal fry is identified by the discreet beats, which may be perceived as the voice fundamental frequency hovers around 50 or 60 cycles per second. There is a tendency for an irregular pattern of double opening of the vocal folds as reported by Moore and a tendency for air flow to be reduced. It sounds as though the person is "too pooped to pop," that he has turned off the motor to his car as he starts in the driveway. Frequently this register is discerned at the ends of words or in words at the ends of sentences. The remedy appears to be to provide strong breath support to the tone.

B. Clearly, approximation may be precluded by at least three vocal fold conditions: (1) a bulge, (2) an indentation or notch, (3) an irregularity of contour. A massive bulging vocal fold is illustrated in conditions of laryngitis or undue thickening associated with irritation and strain. Although these conditions extend along the entire length of the fold their effect is the same: to prevent the soft, delicate approximation of tissue needed for normal voice. When we think of a bulge on the vocal fold, a vocal nodule or node is most apt to come to mind. The node, a thickening of epithelial tissue, usually at the mid-point of the phonatory portion of the folds (i.e. at the juncture of the anterior one-third and posterior two-thirds of the entire vocal fold), clearly will not allow the vocal folds to approximate in the usual manner.

Air loss results and with the air loss there is an element of noise, or aperiodic sound, to interfere with the perceived clarity of the voice fundamental frequency. What then are the feelings or habits of the person with a vocal nodule? In the case of the child, the fact that the term, "screamer's nodules," is sometimes used as a synonym suggests that the child has transgressed the limits of loudness associated with normal voice. The child is apt to have developed the nodules on a basis of accumulated abuse, prolonged excess of loudness. Some children appear to fight a noisy ambient environment with a loud voice. Here is a child from a home in which loud talking and screaming were the rule rather than the exception.

On the other hand there are some youngsters who appear to have the excess of loudness associated with athletic events. Being a successful spectator at a sports event sometimes is equated with yelling yourself hoarse. As you know, the cheerleaders at such events are particularly prone to excesses of loudness and to vocal nodules. In a sample of Florida cheerleaders, fully 10% had vocal nodules. Similarly, participants in these athletic contests may see their own level of loudness as a manifestation of virility and competitive spirit. In therapy it is extremely difficult to alter the habits of the young man who may be

a model of competitive spirit and athletic prowess, and has a commanding voice in his participation.

Although you may have excellent cooperation from the youngster in therapy sessions, during which he demonstrates an easy voice, often it is more difficult to alter his excesses of loudness unless he has been able to alter his own image and permit himself to reduce the excesses of loudness which he has come to expect from himself. Then, and only then, is he amenable to voice therapy. Voice therapy is premature or pointless for the woman who thinks of her hoarse voice as sexy, or the boy who feels that he would let his team down if he didn't holler.

Inasmuch as the vocal nodule is encountered so frequently, and is so clearly due to vocal abuse, it seems appropriate to discuss therapy procedures for this disorder. Such procedures can be set forth as DON'T and DOs: DON'T abuse the voice; DO learn to produce voice easily. The admonition NOT to abuse the voice applies to any excess of pitch, loudness or amount of talking. Let's agree now that a period of silence, or whispering without phonation (including a stage whisper) may prove that the nodule can become smaller, but it is NOT voice therapy without training in using the voice better when the silent period is ended. The answer is NOT to stop phonating but to replace the abuse. The child can learn to express his enthusiasm with vigor on the playground or at a sports event. The mother can learn to summon her children from play a block away with a whistle instead of her voice, to talk in a lower than average voice at a hen party or cocktail party. The singing teacher can learn to demonstrate in her *own* range how a passage should be sung, rather than try to span soprano to bass ranges. The girl swimmer can learn to speak with inflection in an optimal range, rather than growl her words out at a basement voice. Incidentally, a 27 year old woman recently posed a problem of substitute behavior. As best we could figure it out her nodules and hoarseness emerged 6 months ago when she screamed while giving birth without anaesthetic. Somehow we didn't feel that voice therapy warranted our telling her not to have another baby! Fortunately, we noted her habit of clearing the throat forceably, and suggested that, instead, she swallow, or blow the cords clear.

Eliminating the vocal abuse by finding a substitution or modification of the excess may require drastic measures. On occasion, we have asked people to stay away from athletic contests, or to refrain from singing – at least until they were able to use the voice easily. Vocal abuse may be identified as tension (1) in specific situations or with certain people, and (2) in specific parts of the speech tract. Handling situational tension is a key factor in voice therapy. After identifying situation A as one in which abuse is apt to occur, the person seems

unable to avoid tension when in that situation. At the same time in the therapy session, situation B, he gives no hint of the tension he manifests in situation A. Our goal is to bridge the gap between situations A and B, to bring the tension out in therapy in order that it can be dealt with. This process may be thought of as hierarchy analysis, reciprocal inhibition, or the old 2 room technique of stuttering therapy. In effect, the person moves from a point where the symptom is least to a point where it is apt to be greater. By imagining the various situations, the person may recreate his feelings and vocal usage without ever leaving his chair in the therapy session. By "living through" a situation without actually entering it, one may desensitize its power to drive him to vocal abuse.

After identifying sites of specific tension in the speech tract, we have 2 choices: (1) to provide substitute activities to counteract the tension, or (2) to learn to talk with the least possible effort. Techniques in the first category include chewing while talking and yawning or sighing while phonating. Steps in the second category include: breathing air out with the low chest sinking in (no abdominal bulge); starting "ah" (or "ha") with a respiratory (non-glottal) release; phonating as softly as possible (no bulge of the sternal notch); resonating the voice through a relaxed throat and mouth (no laryngeal lift or mandibular drop); say short (not prolonged) phrases with inflection (not monotonously).

In concluding this discussion of therapy for vocal nodules in school children, I'd like to inject a note of optimism. Even if the self-image, situational abuses and sites of physical tension are NOT changed by you, there is every reason to expect that the nodules will disappear at puberty! Hormonal changes and physical growth actually provide the youngster with a new organ for phonating. In therapy you haven't hurt him – eventually you and mother nature will help him. The bulge on the vocal fold identified as a polyp differs structurally from the nodule in that it is more apt to become a pouch, more apt to be vascular, and more apt to protrude to a greater extent than the nodule itself. The development of the polyp has been presumed to be analagous to the nodule with noval abuse as a prime etiologic factor. Feelings and habitual voice practices suggesting tension appear to be equally suspicious in the nodule or the polyp.

Management of the polyp and nodule for children appears to differ. Although the polyp appears to require surgical removal because of the large vascular mass, surgical removal of vocal nodules in children is preached and practiced by very few laryngologists. Indeed many physicians have publicly denounced the policy of surgical removal of juvenile nodules.

In contrast, for the adult or post-pubertal person with vocal

nodules, the decision to remove the nodule by surgery appears to hinge on two factors: (1) the size and firmness of the nodule, and (2) the degree to which precise vocal fold approximation is essential to the person's vocation. Thus, surgery is apt to be reserved for the adult with a hard, fibrotic nodule when his livelihood does not depend on the delicate usage of the vocal folds, such as in professional singing.

Even when surgery is utilized for the nodule or polyp, voice therapy appears indicated to reduce the likelihood of recurrence of another polyp or nodule. The following tape is of a person who developed a vocal nodule within two months after surgical removal of a nodule. On three occasions, this patient had developed and lost, without voice therapy, a nodule, as observed by the laryngologist.

Another example of a bulge on the contour of the vocal folds is juvenile papilloma. This multiple growth around the vocal folds, sometimes likened to a cluster of grapes, illustrates the delicate balance between respiration and phonation. Thus the protrusion on the vocal fold reduces the airway and threatens the respiration.

Surgical removal of the papilloma may be required as often as every month or two. When the mass exceeds a certain limit, phonation is not possible. The following example of whispered speech is by a four year old girl who has had a tracheotomy for two of her four years, and was able to phonate only for a couple of weeks following surgical removal of the papilloma as illustrated in the following tape.

Fortunately this common laryngeal tumor tends to be self-arresting after puberty. However, the surgical procedures for removal of the papilloma may have left the vocal folds with irregular contours which do not permit normal phonation of good quality. The next young lady had twenty-four surgical procedures in her first fifteen years of life.

In contrast to the bulge on the vocal folds, it is possible to have an indentation which interferes with phonation. First and foremost is the voice of an individual who has had surgical removal of a nodule wherein a residual gouge of the fold resulted in a permanent indentation. Consequent air loss and noise accompany phonation. Voice therapy cannot be expected to provide mass to the vocal folds. Moreover, to attempt a firmer glottal attack incurs the risk of generating another nodule at the same site.

A speaker may have bowed vocal folds. The laryngologist may look at the larynx and see vocal folds bowed much as you or I might see a swimmer with bowed legs. Vocal fold approximation along the entire length is not feasible. Again, hoarseness suggests air loss and noise.

Although we may not think of a contact ulcer as a condition of indentation, such is the case. That there is no common associated

dysphonia results from the fact that the indentation is on the vocal process of the arytenoid, posterior to the phonatory section of the vocal folds.

Typically the contact ulcer is developed in a hard driving businessman who uses a low pitch and generally constrained voice. Notice in the following tape the changed voice habits of Mr. C.L. when he imitated speaking on the telephone.

A web on the vocal folds at the interior commissure may extend posteriorly only far enough to alter voice but not to preclude voice.

C. There appear to be three conditions in which, although the speaker CAN approximate the vocal folds with an appropriate balance of respiratory-phonatory tensions, he fails to do so. In one condition he reverts to a substitute source of phonation, the false vocal folds. This ventricular or plica-ventricular voice is seen to be more harsh and less melodic than true laryngeal phonation. The prolonged effort to achieve phonation by inhalation with a sudden switch to voicing on exhaled air may be successful.

A condition known as elective-mutism has been described in psychologic literature. In this condition a child may speak normally around the house and yet may refrain from phonating or speaking with phonation in other environments, such as school. The dynamics of the disorder appear to be related to the obvious feeling on the part of the child that he need not choose to use voice in threatening situations. An extreme variation of this has been referred to as hysterical aphonia. In this disorder the speaker may have laryngeal function, as evidenced by his ability to cough or clear his throat in a somewhat normal manner, yet when he attempts to speak there is no true phonatory activity. Symbolically, it is as though the speaker does not dare to reveal his thoughts in speech. Although usually associated with adults, this disorder can exist in children. Several years ago I was asked to see a young boy, then four years of age, who was said not to talk. History indicated that each parent had married previously. The mother was epileptic and had five children, the father was retarded and had six previous children. This boy was the first child of the new union. Although this lad had not talked with voice, to the parent's knowledge, within 15 minutes he was uttering sounds and words aloud, without any judgment, good or bad, on my part. At the end of our visit I gave him a stick of gum. When we returned to his parents in the waiting room he promptly acknowledged receipt of his gift with a whispered word, "GUM." In this instance I did not reveal to the parents that the boy had phonated, but assured them that his vocal folds were capable of developing additional strength to allow him to talk with voice. During his tenure in the first grade he increas-

ingly used voice in communication, first at school, finally at home.

The following report is by a woman who lost her voice suddenly but who regained it by going, of all places, to California.

Incidentally, we may never see those cases which are managed by the physician who applies an astringent to the vocal folds with the assurance that voice will be acquired immediately!

D. At times a laryngeal web may extend far enough posteriorly to preclude the vibration of the remaining phonatory portion of the vocal folds. This youngster was able to affect only whispered speech with an extensive web.

An individual may have a fractured larynx, damaged so badly that phonation is not practical. Such a trauma may include war injury, automobile accident or being hit across the larynx in a mugging. The following tape is of a young boy whose larynx was so displaced as a result of being hit by a car that upon direct laryngoscopy, to which I was a witness, it was evident that there was nothing resembling structure which would in any way permit phonation. His tracheotomy tube facilitated respiration, while substitute phonation was necessary. At first he was disenchanted with the idea of esophageal speech, and developed some acceptance of and facility with the Bell 5A.

This last young man is but a step away from total laryngectomy. Although we usually associate the surgical removal of the entire larynx with adults, make no mistake, it is occuring at times among children of school age, even of pre-school age. The following tape samples were made with a ten year interval. In the first segment we hear a six year old boy who has been laryngectomized, attempting to echo single words uttered by his 50 year old laryngectomized female instructor. Note the similarities of pitch and of quality of esophageal speech. I also apologize for the quality of the tape.

In the next portion of the tape we hear Paul some ten years later. His esophageal speech has undergone marked change both as to pitch and resonance.

Instead of attempting to spend much time on how to teach esophageal speech, it appears more beneficial to remind you that there are many speech and voice disorders for which the use of an electrolarynx is appropriate speech therapy.

Such instruments can be adequately represented with two brands. The most commonly used instrument is the Bell electro-larynx, model 5A for a man or 5B for a woman. The female instrument is particularly suited for children.

The Cooper-Rand electro-larynx does not function on the principle of applying a vibrating head to the wall of the neck. It may be thought of as a hearing aid in reverse. Battery power from the case is

carried via a cord to the vibrator, to which a plastic tube or conduit is attached permitting phonated sound to be delivered to the oral cavity. The Cooper-Rand would be suitable in those cases in which the neck surface were not large enough to accommodate the vibrating head of the Bell 5A.

As you know, the electro-larynx has been used for a person whose stuttering involves severe laryngeal blocks. It is a way of showing him how he can speak when freed of those laryngeal spasms. The person with spastic dysphonia is a potential candidate for an electro-larynx. The little girl with multiple papilloma may be considered a candidate for an electro-larynx when she starts to school. The boy with a fractured larynx has been using an electro-larynx. Certainly speaking with esophageal speech or with an electro-larynx would be preferable to this pharyngeal speech of low intelligibility.

The person who uses an electro-larynx may need to be educated to the merits of speaking with this aid. Initially he may be too concerned with the conspicuous appearance and sound of such a source of phonation. If he accepts the instrument in principle, he still must learn to use the instrument to its best advantage. Although a representative of the Bell Telephone Company frequently can be of help, it is appropriate for you, his speech clinician, to be aware of a few potential sources of error. The vibrating head of the Bell must be flush with the side of the neck. Good speakers avoid the extremes of unduly short bursts of sound or of unduly prolonged phrases and sentences. Thus it is better to avoid 'my-name-is-Jim-Shanks' as well as to avoid 'mynameisJimShanksIllliveinIndianapolisIndianaandIamouthereinCaliforniaonaveryenjoyabletriptotheVoiceInstitute.' Finally, it is necessary to over-articulate when using an electro-larynx. The payoff is improved intelligibility of speech.

Thus far we have stressed the interplay between respiratory and phonatory processes. To suggest a comparable interplay between the processes of phonation and resonation may seem a bit strained. However, such an interplay may be shown in several ways. The following tape was made of Tibetan monks who chant at a rather low voice fundamental frequency. In resonating these tones, they appear to have developed an overtone of sufficient strength to suggest a second voice fundamental frequency.

An inordinately large number of persons with voice disorders also appear to have undue tension in the pharynx and in the oral cavity. Notice in the following tape; not only is there a component of laryngeal tension but in empathizing with this voice which you hear you almost feel the tension in the throat which he appears to manifest.

Consider also the fact that a large number of persons with velo-pharyngeal incompetence manifest hoarseness; indeed, a larger than expected number develop vocal nodules. Reports in the literature indicate from 22 to 45% of selected cleft patients with nodules!

At the same time it is appropriate to note that although many of us have found no difficulty in relating velo-pharyngeal disorders to disorders of articulation, until recently traditional training did not permit us or encourage us to think of laryngeal disorders as somehow related to velo-pharyngeal incompetence. One final note. On the premise that phonation produced by the larynx will be resonated and molded into vowels by the larynx-to-lip tube, without coupling of the nasal cavity at the velo-pharyngeal isthmus, Zemlin developed a device to measure velo-pharyngeal incompetence in terms of disturbed release of air by the vocal folds. His device originally was called the Zippo or Zemlin Index of Palatal Pharyngeal Opening.

Velo-pharyngeal closure, like glottal closure, may err in being too little or too much, closed too tightly or not enough. Our goal in normal speech thus is a balance of nasal resonance. Clearly nasal resonance is a necessity for the production of the three nasal consonants /m, n, ŋ/. These sounds happen to occur in sequence in the word "morning." To reduce nasal resonance significantly is to run the risk of shifting a given nasal consonant toward the production of an equivalent voiced stopplosive. Thus, in the extreme the word "morning" would sound like "bordig." The ear perceives this as a change of articulation, as a "cold in the nose." Although studies have shown that society may find hyponasality at least as unpleasant as hypernasality, Lilly Tomlin has shown on Laugh-In that hyponasality can also be winsome. This condition of hyponasality results from any undue constriction along the length of the nasal cavity. Such constriction may occur at occluded nostrils, at the posterior choanae as an atresia or at the velo-pharyngeal area as the result of unduly large adenoids, excessive obturation by means of a speech bulb affixed to a prosthesis, or after posterior pharyngeal flap surgery resulting in unduly small ports on either side of the flap itself. Rather than attempt to get into the esoteric question as to whether hyponasality and a cold in the nose can be perceived when uttering non-nasal consonants, it appears defensible to utilize the three consonants as a means of assessing the adequacy of the open nasal tract for speech. Of course, one can and should also assess the openess of that tract for respiratory purposes. Sometimes cleft palate kiddies have difficulty in learning to blow the nose or to sniff after successful pharyngeal flap surgery.

In attempting to ascertain whether hypernasality exists, it appears defensible to utilize those sounds, high vowels, which are most

susceptible to distortion and nasalization in the presence of incompetent velo-pharyngeal closure. In effect, we may assess both hypo- and hypernasality by utilizing a nasal consonant and a high vowel such as in the words "me," "moo," "knee," "knew." At this point it is appropriate to ask about the use of those consonants, such as voiceless plosives and fricatives, which have found to be most adversely affected by velopharyngeal incompetence. Clinically, one may argue that the amount of air loss for these consonants is so small as not to be perceived with accuracy in clinical tests. Further, such articulatory tasks assess, not only velo-pharyngeal function, but articulatory gestures as well. Thus it may be noted that the consonants in the Iowa Pressure Test which are supposed to indicate velopharyngeal incompetence happen to include many of the more difficult, and late emerging, consonant blends! Therefore, let us merely agree that nasal escape of air on voiced as well as voiceless consonants is best considered in the category of disturbed articulatory performances which may be associated with palatal inadequacy, but are not directly predictive of velo-pharyngeal competence. In essence we are striving for nasal balance, in which resonance is free of undue hyponasality as well as undue hypernasality. Just as the occlusion of nares SHOULD produce an alteration in the quality of nasal consonants, so the occlusion of the hares should NOT produce any perceptible change in the quality of a high vowel. That is, to occlude and release the nostrils during a prolonged high vowel should produce no change if velo-pharyngeal closure is satisfactory.

If velo-pharyngeal closure is not adequate, the alteration of quality may be attributed to the conversion of the nasal cavity from an open-ended to a closed-end resonator, with predictable alteration of the resonance properties of that cavity.

There are several implications from focusing our attention on high vowels. First, nasality on low vowels is (in the absence of high vowel nasality) more apt to be functional, without indictment of velopharyngeal closure. Secondly, velo-pharyngeal incompetence is suggested less by variability of nasality than if the hypernasality is consistent. Finally we note that the faulty articulation of consonants is an indictment of such factors as articulatory gestures, etc., as well as velo-pharyngeal competence.

We have suggested that as with disorders of phonation, voice disorders of resonance are best perceived by the human ear, albeit frail. This, however, does not preclude the utilization of respiratory and radiographic evidence of velo-pharyngeal function. Thus it is desirable to obtain an assessment of velo-pharyngeal closure on non-speaking tasks of breathing, such as may be measured with a mano-

meter, or spirometer. In harmony with an observation of Moll, we have found the respiratory task of inhalation to be more sensitive to velo-pharyngeal incompetence than is the breathing task of exhalation. In a series of 100 cases, we attempted to correlate manometric ratios with perceived nasality. The ratios were derived by using the open nose/closed nose fraction.

It may be seen that the positive or exhalatory task produced an undue number of false positive values; that is, manometric readings suggesting velo-pharyngeal competence were achieved by speakers whose speech was perceived to be nasal. On the other hand, the negative or inspiratory task on the manometer resulted in relatively few false positive or false negative scores. In carrying this test a bit further for publication purposes, we noted that the difference score (derived by subtracting the negative manometric ratio from the positive manometric ratio) was most discriminating in cases of mild hypernasality.

Radiographic evidence (in the form of lateral cephalometric speech x-rays or cine-fluorographic records) has been utilized in many clinics. Although the manometer is a relatively inexpensive, portable and convenient tool for you to have available, radiographic evidence often appears harder for the school clinician to obtain. To the extent that you can obtain the services and cooperation of a dentist who has a head-holder or cephalostat, you should be able to get cephalometric speech x-rays to assist you in evaluating velo-pharyngeal competence. Traditional views include lateral views (1) at rest, (2) during sustained production of a high vowel, (3) during a sustained production of a voiceless continuant, such as a fricative [f] or sibilant [s], and (4) during the sustained respiratory maneuver of inhaling or exhaling. Research has shown that these still x-rays are clinically valid, and correlate satisfactorily with the more expensive and hard-to-obtain x-ray movies.

Before considering visual evidence of velo-pharyngeal incompetence, it is well to recall that normal velo-pharyngeal competence presumes a palate which is: (1) intact, (2) of sufficient length, and (3) of sufficient mobility. A flaw in any one of the three dimensions may result in disordered voice. Although an overt cleft is the most usual condition associated with hypernasality, it is by no means the only cause. Nasality can result when palatal intactness is sacrificed by the surgeon who removes a tumor in the palate. Notice the impact on voice as well as articulation in the following 79 year old man.

Moreover, that which appears to be intact may, in fact, not be completely intact, as in the case of the sub-mucous cleft palate. This condition often has, in addition to the requisite dehisence of muscle tissue at the midline of the velum, such stigmata as (1) a fixed uvula, (2) an absence of bone at the posterior margin of the hard palate,

resulting in a "V" pointing anteriorally, and (3) a changed line of velar elevation during function with a ridge in the shape of a "V" rather than the usual arched "U." There are many neuro-muscular conditions which have components of nasality: cerebral palsy, poliomyelitis, a myotrophic lateral sclerosis, myaesthenia gravis, muscularum deformans, myotonic dystrophy. That the management of the nasal voice disorder is not limited to the surgeon's hands is demonstrated in the following tape of a young woman, with myaesthenia gravis. After administration of tensilon, she began to count aloud.

It is mandatory that we speech clinicians not feel it necessary to assume full management for the correction of velo-pharyngeal incompetence. The plastic surgeon, and the prosthodontist who have specialized training, can and must assume responsibility for the correction of the physical deformity. It is foolhardy to the point of malpractice to provide ten years of public school speech therapy for a child with an unoperated cleft. In those cases in which hypernasality is minimal or borderline, we are justified in a period of trial therapy, either aimed at the enhancement of articulatory skills or the development of compensatory mechanisms by which to affect satisfactory velo-pharyngeal closure.

It is necessary that we realize what these compensatory mechanisms are. Some people learn to develop a pronounced bulge on the back wall of the throat as the result of contracting selected fibers of superior pharyngeal constrictor tissues. This Passavant's Pad is indeed dramatic.

A second mechanism involves the exaggerated movement medially of the lateral pharyngeal walls. A third mechanism involves making velo-pharyngeal contact more superior than posterior, or effecting a more shelf-like, flat extension of the functioning velum.

A great deal of attention has been directed at an articulatory approach to the correction of cleft palate speech. Clearly, a child with velo-pharyngeal incompetence may acquire articulatory habits involving omissions, typical substitutions, or distortions. Such errors may be attributed, not to the palatal incompetence, but to the fact that we are dealing with a child. In addition, the person with a velo-pharyngeal incompetence may acquire some compensatory or atypical articulatory patterns, which are not so apt to occur in the normal child. Such errors may include undue elevation of the tongue, a nasal grimace, or wrinkling of the nasal alae, presumably in an effort to occlude the nasal cavity, or as a nasal snort. It should be noted, however, that the nasal snort is neither limited to nor presumptive evidence of velo-pharyngeal incompetence. Occasionally, we encounter a child with a nasal snort despite the fact that he has a

normal palate. This is shown by the normalcy of the high vowel and other consonants.

Three compensatory consonants which may exist in any child's speech, but which are more apt to occur in the person who has had a palatal cleft, are somewhat difficult to identify, and even more difficult to eradicate in therapy. One sound is the glottal stop, not merely at the end of a word.

The pharyngeal fricative or sibilant has a rather low pitch and may be made with the mouth open enough to permit visualization of the back wall of the throat over a lowered tongue. It sounds like this.

The higher pitched palatilized sibilant is more apt to sound like "hy," "Hugh," for shoe.

When velo-pharyngeal competence has been approximated or achieved it is entirely appropriate for us (whether in the public school or in the clinic) to deal with remaining artic errors on the basis of articulation therapy. The new establishment of velo-pharyngeal competence can in no way be expected to alter one's articulatory habits over-night. Your help is needed in establishing normal patterns of articulation.

Although we have not dealt much with the feelings of the person who has had a voice disorder involving nasal resonance, perhaps it is sufficient to recognize that such a person has been subjected to separation from parents, to pain, and to the invasion of the privacy of his mouth. Apart from any consideration of added problems of language or hearing impairment, these children have been through a lot. They have scars on their bodies, in their speech, and in their feelings – which must be recognized.

THE VOICE DISORDERED CHILD

By
Frank B. Wilson, Ph.D.
The Jewish Hospital of St. Louis

During the six years that I served as Coordinator of the Speech and Hearing Department of the Special School District of St. Louis County, one of the most frequent diagnostic and therapeutic problems which plagued the speech clinician was that of voice deviations. Most of the speech clinicians who came to work in the District seemed to have had minimal preparation in the diagnosis and modification of voice deviations. These clinicians had taken a course entitled "Voice" or "Voice Disorders." The courses, they told me, had been concerned primarily with the function of the laryngeal mechanism, including study of respiration, resonation, and pathology of the human larynx. Minimal time was spent on diagnosis of voice deviations (in the beginning the instructor said that information would come later) and even less time on therapeutic procedures (that time never came). The therapeutic techniques that were taught involved rehabilitation of the laryngectomized patient, an area of little practical value in the public school setting.

I found myself in the embarassing position also of not knowing enough about how to deal with the voice disorders of children since the major training I had received in my undergraduate and graduate programs dealt with concepts of laryngeal physiology and treatment of voice disorders in adults. In all fairness to my professors, I would admit that this may have reflected my lack of interest in the area of voice rather than their ability to convey information. Nonetheless, I found myself somewhat ill-prepared when asked by eager young clinicians what to do about voice cases they found in their schools.

My first, and, of course, logical inclination was to say that a voice disorder needs a good deal of cooperative management and that the child should be referred to an otolaryngologist to rule out possible organic problems. Frequently this was sufficiently impeding to delay the case for the entire school year, and, with the high turnover of young clinicians, I had resolved my problem – if not the child's, the speech clinician's. Sometimes the clinician, however, would persist; the parents, though not always happily, would take the child directly to an otolaryngologist; the otolaryngologist would confirm that the child had a voice disorder and recommend that he be sent to the

school speech clinician for therapy. Needless to say, this general recommendation by the otolaryngologist placed the speech clinician, who had sought out the evaluation in the first place, in a somewhat critical position in the eyes of the parents. Another common outcome was for parents to take the child to their pediatrician or family physician who, after observing the oral cavity, decided that the child had no serious problem and told the parents not to be concerned. This was also bad public relations for the speech clinician. Of course, exceptions did exist where a cooperative effort between parents, an interested pediatrician, a capable otolaryngologist, and the speech clinician resulted in good information and counselling and provided a basis for good therapeutic management. Unfortunately, these cases represented the exceptions and not the rule. In fairness to the physician, it is possible that the speech clinician did not ask the appropriate questions, a problem too common to speech clinicians.

During my tenure with the Special School District, I became more interested in exploring the problems of voice systematically to determine how frequently such problems occurred in children, what characterized them from educational, social, and medical points of view, and which therapeutic procedures produced vocal improvement. In order to devote more time to the study of voice disorders, I accepted an affiliation with The Jewish Hospital of St. Louis. We were fortunate to obtain financial assistance from the United States Office of Education for three years which allowed us to work systematically toward a better understanding of the prevalence and problems of voice disorders in school-age children.

A first step in this study of voice disorders was to find some systematic language that would permit consistent description. We were not interested particularly in the usual terminology which tends to label children. Rather, we thought a scale which described the various audible characteristics of voice would be most useful. The profile that we developed was not original; its genesis lay in work by Isaac P. Brackett[1] in which an attempt was made to describe in considerable detail the various components of voice. Dr. Brackett served as a consultant to our program and was willing to make modifications in his descriptive approach. The finished product, Figure 1, resulted in a voice profile which I thought could be used by most clinicians whether in public schools or community service centers. (I might point out parenthetically that in our use of this scale over the last three years, we have become more and more impressed with its brevity. Its simplicity increases diagnostic effectiveness.) The characteristics of voice that we will attempt to change in therapy are described.

[1] Systems Vice President and Professor, Southern Illinois University

The following material explains The Jewish Hospital Voice Profile. At the top there is a section for "identifying information" and a brief statement of case history.

Figure 1.
The Jewish Hospital Voice Profile

NAME: _____ AGE: ___ B.D.: ___

GRADE: _____ SEX: _____ DATE: _____

How long has the problem existed? _____ Voice Rating: 1 2 3 4 5 6 7

In what situations is the voice better or worse? _____ Constant _____

_____ Variable _____

Length of sustained "ah" _____

LARYNGEAL CAVITY	RESONATING CAVITY	INTENSITY
PITCH	NASALITY	
high	hypernasal	-2 1 +2
B	C	soft loud
+3	+4	
+2	+3	
	+2	VOCAL RANGE
A open -4 -3 -2 1 +2 +3 closed	1	
-2	-1	-2 1 +2
-3	hyponasal	monotone variable
low		pitch

Comments _____

_____ Examiner: _____

Marking System

X Primary Feature \ Secondary Feature

\ Noted Feature int Intermittent Feature

Severity Rating: In the upper right-hand corner of the card the section called "Voice Rating" is used to describe on a comparative basis the voice as it affects the clinician. A rating of "1" means the problem is barely perceptible; a "7" means the problem significantly interferes with communication. This judgment has an effect on the decision to provide therapy and on determining progress during therapy.

Sustained Ah: We have found that measuring the length of time an indiviudal can sustain the tone *ah* has considerable relationship to laryngeal efficiency, provides an acceptable measure of change in air loss during phonation, and can indicate the reduction of the obstruction to vocal fold closure.

The lower half of the Voice Profile card is of prime importance. The horizontal line "A" deals with the open and closed portion of the vocal folds. At the extreme left, -4 would mean the folds are totally open: the vocal chink is nonrestrictive of the airflow and the individual produces little, if any, friction noise in attempted communication. One would describe this, in a clinical model, as aphonic production. To the extreme right of line "A," +3 represents extreme tension, more accurately, a random closure, with inability of the individual to sustain normal vocal fold vibration. This is the common type of mechanism which persists in an individual with spastic dysphonia. Between these extremes, moving from left to right, -3 represents narrowing of the vocal chink and the production of a whisper, the individual's attempt at voicing characterized by considerable friction. Breathiness in voice is represented by -2, and generally is characterized by turbulence and some friction. A normal voice is represented by 1, or the center point of line "A." The +2 side represents a voice which is characterized by much tension. The individual maintains vibratory motion, but has voice characteristics that give the listener the impression of vocal strain.

Laryngeal Cavity. The vertical line "B" of that same portion of the card titled "Laryngeal Cavity" deals with the factor of *Pitch.* In the context of our profiling, *Pitch* is primarily social. Neither end of line "B", marked +3 at the high and -3 at the low, stands for a fixed pitch. Rather, they denote those pitches which are sufficiently deviant to cause the individual to lose sexual identity if this judgment is made on voice alone. Pitch levels at these extremes are rarely heard in children. The -2 and +2 represent deviations of pitch that cause concern primarily on the part of the critical listener, usually the speech clinician. They rarely cause the person social anxiety.

Resonating Cavity. Under the section "Resonating Cavity," Line C, -2 represents the voice with a lack of nasal resonance in the production of normally nasalized sounds. 1 represents normal, +2 represents assimilation nasality, +3 represents nasalization of vowels with some shading of a nasal nature to the consonants, and +4 represents nasality of all sounds with frequent nasal distortions of consonant sounds.

At the far right of the card, there are two additional components of voice: *intensity* and *vocal range.* We think of these dimensions as

descriptive aspects of voice more than as primary components. In addition, on the right side, the clinician should check "variable" or "constant," referring to the existence of the deviation over time and under differing conditions. We have also left a portion of the card for comments. This is valuable space in which to mark clinical subtleties not covered by the Profile, such as pitch breaks, vocal fry, and varying types of voice production which change with the complexity of the communicative situation. The bottom of the card presents the marking system.

After arriving at a workable description of voice deviations and disorders, the next step was to train school clinicians, using the Voice Profile, to identify children with deviations in voice. Through the cooperation of William Healey[2], who succeeded this author as Director of the Department of Speech and Hearing Services of the Special School District of St. Louis County, 50 speech clinicians were selected to conduct a study of the prevalence of voice disorders among elementary and junior high school students. The clinicians were trained systematically in listening and descriptive procedures for a period of four days by Isaac Brackett and the author. At the end of the training session the clinicians' reliability and consistency as listeners were checked. The training was completed in September of 1966, and during routine fall screening the clinicians recorded the voice behaviors of 32,542 children. As a result of this screening the clinicians determined that 1,962 children had some form of voice deviation. The Voice Profile was completed for all children who appeared to have voice disorders. The completed profiles were sent to the Special School District office, and the program director notified parents that their child appeared to have some form of deviation in voice. The research project was explained, and the parents were asked to cooperate in the study by scheduling an appointment at The Jewish Hospital for a thorough evaluation of their child by a team of interested specialists. They were assured that no charge would be made for this evaluation and that the results would be made available to them and to their school.

In the years that followed, we saw approximately 1122 of the 1,962 children with voice deviations and accumulated information about etiology, family structure, emotional behavior, verbal behavior, otolaryngological function, and the amenability of voice disorders to various types of management. Detailed information about the specific findings in each category is available. It is pertinent within the context of this article to give only a general overview of our findings.

[2] Associate Secretary for School-Clinic Affairs, American Speech and Hearing Association.

Of initial interest was the number of children referred from the schools who, at the time of The Jewish Hospital evaluation, had no problem that was acoustically discernible. Although this amounted to 24% of the cases referred, it did not, necessarily, indicate that the clinicians had been inaccurate in their evaluations. Rather, we were able to confirm existing evidence of the transient nature of some voice disorders. In most of these cases we were able to determine from interviewing the parents that the child had experienced previous difficulty with his voice. Parents frequently commented that the child had manifested respiratory infection, laryngitis, or some other type of upper respiratory deviation, possibly of an allergic nature, during the autumn. Most of these parents stated that the child did have a hoarse voice for a period of time but that it did not last.

Of the 1,122 subjects diagnosed, 76% had deviations in voice ranging in severity from those which were barely perceivable through voice problems which truly interfered with the child's ability to communicate. It is important to add that many of the cases which were seen for evaluation as part of the research study were not recommended for therapy because the problems were mild. Characteristics of breathiness or tension, or mild nasality or denasality, did exist in the voices of these patients and may well have indicated either developing problems or problems which had existed earlier and were receding as the result of improved voice utilization or adaptive behavior. Before data are presented about the evaluations of these children, I should indicate that the initial referrals probably provided our best cross-sectional sampling of school children with mild to severe deviations in voice. As this study progressed, more of the cases seen were severe in nature, representing our specific desire to evaluate and develop various management procedures for specific types of voice disorders.

Our finding that approximately 6% of elementary and junior high school children have voice deviations is consistent with earlier findings (Baynes, 1966) in a study of hoarseness in the Oakland County Public Schools, Michigan. This large percentage represents children with voice deviations but does not represent, necessarily, cases that are in need of immediate service from a speech pathologist. A realistic figure for cases needing therapy is 1 to 1.5% of the school age population. This percentage of children has severe voice disorders which interfere with communication and represent a symptom of hyperverbal behavior. This 1 to 1.5% encompasses problems of laryngeal cavity deviations as well as problems of resonance.

Eighty-seven percent of the voice-disordered children had deviations which fell under the heading *laryngeal cavity*, primarily voice deviations characterized by +2 tension, -2 breathiness. In addition to

the factors of breathiness and tension, a frequent concomitant characteristic was lowered pitch, usually -2 on the pitch scale. Twelve percent of the children had some form of resonance problem; 10% falling into the classification of hypernasality, ranging from characteristics of assimilation nasality (+2) to resonance deviation commonly associated with cleft palate in which not only vowels but consonant sounds are disturbed as a result of velopharyngeal insufficiency (+4). About 2% of the children had problems of denasality, an area that we consider primarily in need of medical evaluation and not so amenable to voice therapy. An additional 1% of the children presented problems which fell into the categories of *vocal range, intensity*, or *rate* (see Voice Profile). *Intensity* was most frequently checked.

In the voice-disordered group of children seen for comprehensive evaluation at The Jewish Hospital males outnumbered females by slightly less than two to one.

Table I
Sex Distribution of Children Referred as Voice Deviants

	Number	
Male	707	(63%)
Female	415	(37%)
Total	1122	

If we look at the age distribution of the 1,122 children with a diagnosis of voice deviation referred to the hospital by the school speech clinicians, we note that the largest number occur between six and 13 years of age, with over 89 percent of them between six and 11 years (Table II). A definite predominance of males over females in the ratio of almost two to one is clearly shown in Table I.

Table II
Age Distribution of Children Referred as Voice Deviants

Age	Number	
18+	7	(.6%)
16 - 17	12	(1.0%)
14 - 15	16	(1.4%)
12 - 13	79	(7.0%)
10 - 11	269	(24.0%)
8 - 9	325	(29.0%)
6 - 7	402	(36.0%)
4 - 5	12	(1.0%)
Total	1122	

As part of the evaluation at The Jewish Hospital, the children were examined by an otolaryngologist whose findings were reported in an earlier article by Senturia and Wilson (1968). In addition to the otolaryngological evaluation, an audiological assessment was performed on each child. It was interesting to note that considerably more children in the voice study were found to have hearing deviations than one would anticipate in the normal population. The Special School District of St. Louis County has conducted annual hearing surveys for many years and consistently reports approximately 3% of the children as having a loss of 20 dB ISO or greater in two frequencies in one ear. In the population studied as part of the Voice Grant, approximately 14% had losses which reached that criterion. The most common type of loss was conductive in nature, representing, to a large extent, the group that was found to have other otolaryngological problems. In addition to the specific physical findings, the children were evaluated by a staff psychologist using projective procedures, specifically the Rorschach and Thematic Apperception Test. At the present time there is a substantial body of information which supports the contention that children with +2 -2 voices, typically resulting from vocal nodules, have a greater tendency toward aggressive behavior and other abnormal responses on projective tests than do their normal peers (Mosby, 1970; Lamb and Wilson, 1971).

In addition to tests of emotional behavior, we also studied intellectual functioning and found that, as a group, voice-disordered children do not deviate significantly from their peers in the specific school districts from which they were referred.

The last behavior we attempted to describe deals with the family structure in which the children with voice disorders lived. Each family, upon their arrival at The Jewish Hospital, was interviewed by a social worker to determine any potentially significant characteristics of the home environment. We were interested specifically in factors such as divorce, separation, abnormal living conditions, numerous adults in the home environment, abnormal parent-child relationships, and unusual sibling relationships such as children resulting from different marriages. Normative data on this kind of information are difficult to find, but social workers and sociologists in the St. Louis area estimated that approximately 21% of the families in the county would have some degree of "family pathology." In analyzing the information obtained on the voice disordered sample, we found that over 42% of the children came from homes where deviant family structure and living arrangements existed.

Summary

I have outlined a clinical method for describing voice disorders in children (and adults). Information derived from the utilization of this descriptive technique by 50 school clinicians in the St. Louis area was reported. Specific findings indicated that 6% of the children in the elementary and junior high schools of St. Louis County had deviations of voice which were noted and described by clinicians trained to listen for specific characteristics of voice. Follow-up evaluations at The Jewish Hospital of St. Louis showed that 76% of the children were found to have notable deviations in voice; 24% of the cases had normal voices at the time of the follow-up evaluation, but gave strong indications that earlier voice deviations had existed as a result of upper respiratory infections or allergies affecting the upper respiratory tract. Of the 76% with notable voice disorders, a distribution existed ranging from descernible deviations in voice to voice disorders which impaired the individual's ability to communicate effectively. Many of the children who were evaluated had deviations in voice which would not require clinical treatment by most speech clinicians, whether working in a speech and hearing center or in a public school. Approximately 1 to 1.5% of the children presented voice disorders that justified voice management and therapeutic intervention.

The children with voice disorders studied at The Jewish Hospital were found to have a higher than normal incidence of conductive hearing losses, otolaryngological problems, tendency toward aggressive behavior, and pathological family characteristics.

Management

To the active clinician the easiest part of the program is finding and, with a little training, describing the deviant behavior. The real complication comes with our attempt to manage the problem. To ameliorate a voice disorder in either a child or an adult, the clinician should have given consideration to a few, if you will, rules.

1) The voice you hear is a logical end product of the use or structure of the voice-producing or modifying organism. To expand that point, the voice clinician can develop tremendous insight into the patient's disorder by listening systematically. Rarely have we seen a patient whose voice deviation could not be traced to a logical deviation in the structure or function.

2) Referral of the patient to the otolaryngologist should be made with discretion and is logical only after a careful analysis has been made by the voice clinician and we have a good concept of the particular voice and what may be active in causing the problem. Remember, you are not asking for a voice disorder confirmation, but

rather consideration of the structural abnormalities which exist and careful consideration of whether they are amenable to medical or surgical management; i.e., if a child has nasality, he should be considered for prosthetic and surgical treatment rather than voice therapy, a patient with an observed pedunculated polyp should be treated surgically with secondary consideration to vocal hygiene. The referral should have as an integral part a complete description of the voice and factors that may structurally contribute to the acoustic effect. Remember, the laryngologist can be, and generally is, extremely helpful in your management of the voice patient. Don't be afraid to spend a few sessions experimenting with voice description and manipulation before referring. With children the value of a referral is less imperative than in an adult. Particularly the adult with a long history of smoking or voice deviation. Even here, don't panic. Make sure your referral includes good questions and descriptions.

3) The procedure you use to work with the problem should have as a secondary end product teaching the patient how to work on his own problem. In a real sense, he becomes a subprofessional. It is helpful to plan your treatment procedure to include: (a) a visual and acoustic understanding of the problem, (b) a logical reason for the deviation, (c) increased understanding of etiology, (d) techniques for bringing about change, and (e) vocal and personal hygiene.

With acceptance of these preliminary rules, we will try to outline a management procedure used primarily as a group approach with suggested changes for individual therapy. The concept of group therapy fits very well with children, particularly those who have the type of symptoms that usually are manifested by vocal nodules. Adults in our experience are better managed on an individual basis.

In our particular environment, the patient usually comes to us with a diagnosis of bilateral nodules which unquestionably makes our task less complicated. The absence of that advantage does not negate the usefulness of this program. It only increases your need to be resourceful. Wherever possible, obtain good visual inspection of the laryngeal mechanism (indirect laryngoscopy performed by a laryngologist). Our main concern is to sort voice problems stemming from extra tissue growth, such as nodules, from chronic infection of the laryngeal area, arytenoiditis. The perceived voices of these two diagnostic groups will be different. The difference will frequently be difficult to perceive. A necessary adjunct to your listening of voices of children is the collection of information pertinent to the problem.

The following generalizations should be given consideration but by no means should they be followed didactically by the clinician. If the voice problem is of long-standing duration, in excess of one year, with a predominance of breathiness, a lowering of pitch, and some

tension, and the patient has no history of vocal abuse, but indications of general pharyngeal rhinosinusitis type of allergy, the likelihood is that the problem would be chronic irritation and is best treated medically.

On the one hand, if the problem is of recent vintage, developed out of some type of vocal abuse, or the patient has a history of vocal abuse, or aggressive vocal behavior, then one would give greater consideration to the problem of nodules. One of the most effective approaches we have found to sorting these two problems (particularly if you are working individually) is to have the patient go on some type of reduced vocal utilization." Before we start the patient on the reduced vocal utilization, we obtain a high quality recording of the voice, then try the reduced vocalization for one week. If the problem stems from misuse, there will be a marked change in the voice of the patient toward considerable improvement. If the problem stems from purely allergic or systemic irritation of the laryngeal mechanism, the voice will not improve. Occasionally we will have a combination of these if the patient has some rhinosinusitis and has caused irritation of the folds by over driving the mechanism. However, in both cases where we have improvement, it is then worthwhile to approach the problem from a vocal reduction or tension reduction basis.

If, on the other hand, the patient does not improve, then it is essential that you give consideration to a good laryngologic referral since it is only through medical treatment that the patient will eliminate the problem.

Other considerations about deviations in voice will be made clear as we listen carefully throughout the day to various types of voice and try to understand how the mechanism can function in order to produce a particular deviation. This, I think, can only be done through careful listening, and, therefore, we will now go into a consideration of a voice therapy program that we have found quite successful dealing with groups of children.

A Group Voice Therapy Approach

[The material below is taken in part from an article by Connelly, Wilson, and Leeper which appeared in the Missouri Journal of Speech and Hearing Disorders, 1969]

Initially, the children were placed, three of four in a group, according to chronological age. Criterion for selection included the presence of vocal nodules as noted via indirect laryngoscopy and a reported behavior of misuse of the voice. The children seen in voice therapy at the hospital ranged in age from seven to thirteen years. Weekly group therapy sessions, one hour in length, extended over a six week period.

1) Descriptive Explanation of Laryngeal Function

A descriptive explanation of laryngeal function was presented through illustrations from Ciba's pamphlet on the larynx (Saunders, 1964). The purpose was to present to the children a detailed description of the function of the laryngeal mechanism. Together the children and the clinician reviewed the findings of the otolaryngologist as he had visualized them for each child. Through viewing the Ciba illustrations, the physician's technique for observing the vocal folds became evident. Pictures were used to describe the pathology at a level which the children could understand. The vocal nodule was compared to the development of a callus on the foot which develops from misuse. It was mentioned to the child that the vocal folds also develop these abnormal growths (nodules) when misused through yelling and screaming. Following constant misuse, the folds create a new tissue formation which may then develop into a callus-like growth. It was pointed out that the nodule develops as a mass on the vocal folds which does not allow proper closure and results in an excess amount of escaping air. This is usually perceived by listeners as a "breathy" voice. It was also pointed out to the children that in order to produce a more forceful voice, he must forcefully strain to obtain voicing and this strain increases muscular tension in the laryngeal area. The resulting voice is then perceived as a combination of these conditions (breathiness and tension) and has been labeled as "hoarseness." The conversation about the development of a nodule is conducted in an adult-like manner emphasizing the seriousness of the problem without causing undue alarm and explaining what vocal misuse is and how it contributes to the development of vocal nodules. As a daily reminder, charts were distributed and each child was responsible for rating the "goodness" of his vocal production. Colors were used to designate whether or not their voices were good for that particular day (green is good; red is bad). When the children returned to therapy the following week, they brought their charts with them and each compared the other's progress during that week. This procedure can develop a healthy, competitive atmosphere in the group, since each child appeared to want to obtain the most green points for the week. It may also help develop group rapport and a common knowledge that someone else has a similar problem and is attempting to correct it.

2) Inter- and Intra-comparative Judgments of Quality

The children's voices were tape recorded during each therapy session. Reading passages below the children's graded reading level were employed to rule out problems with reading fluency. The

children also counted from one to ten, and sustained the vowel /a/ for later analysis of changes in fundamental frequency across time. Many of the children seen in our clinic have an habitual pitch too low for good vocal efficiency. Changing pitch to a higher level is also valuable in eliminating roughness in the voice. Group discussions followed this recording session, during which time the children compared the characteristic of each other's voices. Quality changes can be noted by using alternate high /i/. /u/ and low /a/, /ɔ/, /ʌ/ vowels for this comparison. Comparative judgments appeared to sharpen the children's perceptual boundaries to the likenesses and differences in their voices; specifically, those parameters of breathiness and tension. Comparative judgments were made of tape recordings. Our approach was to record a child's voice during reading activities, then have him engage in strenuous physical activity. The child's voice was then re-recorded and played back for quality judgments. The second voice recording should be more breathy than the first without tension – "a good" change, one to be noted by the child. The clinician simulated these vocal qualities to reinforce what parameters they were listening for in each others' voices. For example, we asked the children, "What does Sally sound like?" Possible answers were as follows: "Sound scratchy," "Funny like she can't get her voice ou'," "Her neck is so tight looking." Some of the children used a voice with excessive loudness, and appeared to be unaware of their restricted range of vocal intensity (Leeper, 5). This fundamental procedure allows the child and the clinician to describe the differences in loud and soft voicing by employing a sound level meter and a VU meter. Decreases in loudness also developed a sense of soft attack on words which is a focal point in the therapy regimen.

In ongoing sessions, one could observe the children begin to constructively criticize not only others' voices, but their own as well. Through listening, they noted gradual changes from week to week.

While discussing the characteristics of their voices, the children appeared to discover that not only did their voices contain elements of tension and/or breathiness but they also began to realize their strong tendency to misuse their voices. As the sessions progressed, the children became more sophisticated in describing their particular voice disorders, and they began to use the instructor's terminology for the voice problems involved.

3) Establishment of the Self-concept of Normal Voice

To establish a more "normal" voice, we stressed the need to learn more acceptable ways of using voices. The following exercises were employed:

a) *Introduction of correct breathing.* The children were asked to

stand, push in their stomachs with their hands (as if squeezing air out of a balloon) and let all their breath out. They then rested and held their breath for a second and then expanded their chest cavity and pushed their hands out, at the same time. It is often helpful to have them think of their waistlines as a balloon filling up with air. The children then released the air immediately (here the balloon is collapsing) and rested. This is repeated, chest out, ribs in, at the same time that the clinician explains that good quality begins with the proper action of the breathing mechanism. The clinician describes where the diaphragm is, how the coordinated action of the lung works, and what is thought to help produce acceptable voicing. It was observed during this activity that many of these children appeared to be using inappropriate breathing patterns, that is, they did not appear to use the full breath support mechanism for all phonatory tasks. As a result, much tension was observed in the neck and chest regions. After the children were able to breathe systematically in a more advantageous manner, it was found useful to have them count on exhalation while using correct breathing habits.

b) *Relaxation Procedures.* Another useful activity for relieving tension was to have the children drop their heads down on their chests as if they were a heavy ball. The children were asked to roll their heads around very slowly three times each way, keeping their mouths open slightly. During this exercise, many of the children initially appeared very tense and when their heads were supposed to drop they remained in an upright position. Re-education concerning relaxation is an important part of the therapy regimen and helps the child learn to monitor tension as it occurs in the laryngeal area. To observe this tension, the children were asked to push against a table, causing physical tension, then relax immediately during the sustained production of /a/ sound. It may be helpful to employ this pushing technique when attempting to make better vocal fold closure with many children with nodules. It may also be used to describe what abnormal vocal tension is and how it may be released. The children also did physical exercises, such as pushups and touching their toes, to show that physical exercise often relaxes tension in the neck and chest areas when energy is not directed toward a speaking task. This was done to direct the feeling of tension away from the speaking situation by having the children expend energy in a more meaningful manner. After the boys did pushups, they would stand up, relax, and then count to ten. This technique resulted in a notable change in the roughness quality in the voice. During this exercise, the children often indicated to the clinician that they did notice differences in their voices. At this stage, the clinician may begin to use more oral read-

ing material. This gives the children another opportunity to hear and compare their vocal productions with their peers and to note the correct posture for speaking. The children may also use short phrases and sentences in more spontaneous speech situations. In addition, spontaneous discussions often arose in which the children and the clinician could discuss problems encountered in the home or school environment which precipitated vocal abuse. Many of the experiences which caused them to misuse their voices were similar. Discussions led by the clinician may be directed towards ways of improving these these situations causing vocal misuse. These discussions appeared to cause the children to develop a more positive attitude about their voices, made them more aware of the times and places where they yelled and screamed, and pointed out the necessity for finding more appropriate ways of using their voices. Explanations of therapy procedures employed with the children were also mentioned to the parents. Emphasis was placed on the need to have children stop yelling at home and at school. Parents were counseled not to remind the children during earlier sessions to stop yelling and screaming, since it is important that the children begin to gain insight into the problem and take personal responsibility for their own vocal behavior.

During later sessions, the parents were given a chart upon which to record their child's use of voice during the week. This chart was to be shown to the child. The parents did not remind the children of their vocal exercises during this period. In more final stages of the therapy, the parents viewed the children on a closed circuit television system or through a two-way mirror to increase awareness of changes made in vocal behavior. During these sessions the children were reminded about good voice habits and discussed consequences of misusing their voices. Children who were doing an adequate job during the latter stages of therapy did not receive a voice chart for that week. The lack of a voice chart then became a visual indication of progress. If one child received a voice chart during this time, it was apparent that he was not following all the therapist's instructions pertaining to the assignment for the previous week. (If they received a chart they were sometimes criticized by the group. Group interaction and acceptance appeared to be a necessary factor in this type of therapy). In the final stages of therapy the parents were also asked to check on carryover outside of the therapy session and to schedule an otolaryngologic re-evaluation. It should be mentioned to the parents that it was not our purpose to remove vocal nodules. Our task was to introduce more acceptable patterns of vocal behavior to the children and in the process frequently remove the bases for this type of vocal pathology.

In the above material we have given prime consideration to the

aspect of a group approach using group dynamics and peer competition to reduce vocal abuse. Over the past years with this technique we have been successful in eliminating the factors which contribute significantly to vocal nodules and, in the final analysis, after a marked change in voicing approach, have successfully eliminated the nodules in children. We have found that individual therapy is basically the concentration of the material we have mentioned above. When working individually, the clinician is usually more directive, using shorter therapy sessions, thirty minutes once or twice a week. In group work, to make most effective use of the dynamics, sessions should be planned for at least one hour – and preferably longer.

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CONCLUDING REMARKS

By
Dorothy Molyneaux, Ph.D.
San Francisco State College

It is a pleasure to meet with you again for a brief "summing up" before this conference closes. I am very much aware that each person derives something unique from a conference such as this. We all come here from different settings and with a variety of previous training and experiences. We all have somewhat different current professional interests and obligations depending upon our areas of employment and our current caseloads. Therefore, each of us would no doubt summarize differently the most important points we feel we have gleaned from these three days. However, there are a few general points which I would like to comment upon briefly.

First of all, I feel we are even more aware now of the tremendous importance of *listening* in our voice therapy work. We have certainly heard some wonderful tapes here at the conference. I feel that our speakers should be commended again for sharing their outstanding tape collections with us so that various voice disorders could be listened to and analyzed in the company of experts.

Not only has the importance of careful listening and of recording our clients' voices been stressed, but we have also been reminded of the importance of using some system for describing what we hear. Using a "voice profile" or some other well though out aid to record our observations can be extremely helpful. In regard to evaluation and assessment, the idea of noting "primary" and "secondary" characteristics is also helpful, as is the concept of noting which vocal symptoms are primarily compensatory behavior for a more basic, underlying abnormal condition.

We have also been reminded how important it is for us to help our client become more aware of his voice and how he uses and abuses it. Our speakers have emphasized the importance of obtaining a client's case history and medical history, as well as specific information concerning fluctuation of the voice problem and instances and patterns of vocal abuse. In addition to the effects of vocal abuse and of various types of laryngeal abnormalities, we have been reminded of the possible adverse effects upon the voice of pollution, poor nutri-

tion, infections of the upper respiratory tract, and allergies. The importance of a laryngoscopic examination in many cases of voice disorder (and of cooperation and information-sharing among the specialists involved) has also been emphasized.

Several times during the conference, I was reminded of that motto we see so often about having the "courage to change those situations which can be changed, the serenity to accept those conditions which cannot be changed, and the wisdom to know the difference." In our evaluation of voice disorders and our decisions regarding the part we will play in therapy, it seems to me that we must have the professional confidence and "know-how" to help modify vocal characteristics which can be altered through the client's effort; the serenity to accept those laryngeal conditions (or systemic conditions) and vocal characteristics which cannot be changed by our efforts; and the wisdom and clinical acumen to know the difference. We must be ready and willing to engage in dialogue and cooperative effort with pediatricians, general physicians, otolaryngologists, psychologists, classroom teachers, and parents (not to mention the client himself) whenever such efforts are called for.

Hopefully, then, we have gained in a number of ways through attendance at this conference. We have gained in knowledge and techniques so that we can help more children develop voices that are efficient, effective, and pleasant. Perhaps we have also gained ways to help our colleagues in the teaching profession conserve their voices and employ a "maximum of vocal production with a minimum of effort." Hopefully, we have also become more aware of our own voices and how to care for them. One of the conference participants commented this morning that he had noticed there was much less coughing and smoking by the members of the audience on this third day of our conference compared to the first. So maybe we are already being kinder to our own vocal mechanisms!

We could go on at length attempting to summarize what we have learned during these three days, but it is time to close. Before we do, though, I feel that we should commemorate such a worth-while conference in some manner. I have therefore composed a memorial chant in honor of the occasion. I hope it will serve to remind you of the conference and of some of the many points made by our fine speakers.

THOUGHTFUL UNCERTAINTY

by
Dorothy Molyneaux, Ph.D.

(To be chanted by the voice therapist in times of dilemma)

By Apollo, the physician
And through Wilson, Boone, and Shanks,
We have grown in art and wisdom;
And for this, we offer thanks.
While we work with childhood voices;
While we aid and health afford;
This will ever be our watchword:
"We will listen – and record!"
Tension, pitch, vocal range?
Coughing, laughing, – any change?
Loud or soft? Diplophonic?
Folds hyper- or hypo-tonic?
How's the nasal resonation?
Any varied intonation?
What about approximation:
– Plus or minus three?
Is there something I am slighting?
Should referral be in writing?
Is this functional or organic?
Does it need *artist* or *mechanic*?
Nodules, polyps, papilloma;
Intubation granuloma;
Web; paresis; carcinoma:
Which one might it be?
How's my parent orientation?
How's my client's motivation?
Does my client *hear* his voice?
What's my therapy of choice?
Voice-tape making; history taking; charting the abuse;
Yawning; sighing; glottal frying; cutting vocal use;
Vocal chewing; interviewing; lessening the strain:
May these techniques, and our efforts, never be in vain.